SYLLABUS

FOR

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME- SANDWICH)

[DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY]

N-20 SCHEME

IMPLEMENTED FROM 2020-2021

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE (AUTONOMOUS)

MADURAI-625011

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TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE,

(Autonomous)

MADURAI- 11

N-20 SCHEME

(Implemented from the Academic Year 2021 - 2022 onwards)

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TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE(AUTONOMOUS), MADURAI - 11
DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

N-20 SCHEME

(Implemented from 2020 - 2021)

R E G U L A T I O N S*

1. Description of the Course:

a. Full Time (3 years)

The Course for the Full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters* and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4^{th} and/or during 7^{th} semester the students undergo industrial training for six months / one year. Industrial training examination will be conducted after completion of every 6 months of industrial training.

c. Part Time (4 years)

The course for the Part Time Diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*. The subjects of 3 years full time diploma courses being regrouped for academic convenience.

**** Each* Semester *will* have *16 weeks duration of study with 35 hrs. / Week for Regular Diploma Courses and 18 hrs. / Week for Part Time Diploma Courses.***

2. Conditions for Admission:

Condition for admission to the Diploma courses shall be required to have passed in The S.S.L.C Examination of the Board of Secondary Education, Tamil Nadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in Tamil Nadu.

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamil Nadu.

Note: In addition, at the time of admission the candidate will have to satisfy certain minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):

A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in Tamil Nadu affiliated to the Tamil Nadu Higher Secondary Board with eligibility for University Courses of study or equivalent examination & Should have studied the following subjects.

A pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational		Industrial Training **Institutes** Courses
		Subjects Studied	Subjects Studied		
			Related subjects	**Vocational** subjects	
1	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade

- For the Diploma Courses related with Engineering/Technology, the related/equivalent subjects prescribed along with Practicals may also be taken for arriving the eligibility.
- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.

- **Age Limit: No Age limit.**

- **Medium of Instruction: English**

- **Eligibility for the Award of Diploma:**

  No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to the State Board of Technical Education and Training, Tamil Nadu, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

  The minimum and maximum period for completion of Diploma Courses are as given below:

Diploma Course	Minimum Period	Maximum Period
Full Time	3 Years	6 Years
Full Time (Lateral Entry)	2 Years	5 Years
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

This will come into effect from N-20 Scheme onwards i.e. from the academic year 2020-2021.

- **Subjects of Study and Curriculum outline:**

  The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects.

  The curriculum outline is given in Annexure – I.

4. Examinations:

Autonomous Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment. Autonomous Examinations are conducted for 100 marks and reduced to 75.

The total marks for result are 75 + 25 = 100 Marks.

5. Continuous Internal Assessment:

A. For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to bedistributed as follows:

i) Subject Attendance **5 Marks**

(Award of marks for subject attendance to each subject Theory/Practical will be asper the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

ii) Test # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Average ofthese two test marks will be taken and the marks to be reduced to: 5 Marks

The Test-III is to be the Model Examination covering all the five units and the marksobtained will be reduced to: **5 Marks**

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	Model Examination: Covering all the Units. (Autonomous Examinations-question paper-pattern).	End of 16th week	100	3 Hrs

From the Academic Year 2020–2021 onwards.

Question Paper Pattern for the Test - I and Test — II is as follows. The tests should be conducted by proper schedule. Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions x 1 mark	06 Marks
Part B Type questions:	7 Questions x 2 marks	14 Marks
Part C Type questions:	2 Questions x 15 marks	30 Marks

Total **50 Marks**

iii) Assignment **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 5 marks.

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2½ marks for the material submitted in writing and 2½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks.

All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Autonomous Exam results and produced to the flying squad and the inspection teamat the time of inspection/verification.

B. For Practical Subjects:

The Internal Assessment mark for a total of 25 marks which are to be distributed as follows:-

a) Attendance : 5 Marks (Award of marks as theory subjects)

b) Procedure/ observation and tabulation/ Other Practical related Work : 10 Marks

c) Record writing : 10 Marks

TOTAL : 25 Marks

- All the Experiments/Exercises indicated in the syllabus should be completed and the

same to be given for final Autonomous examination.

- The observation note book / manual should be maintained for 10 marks. The observation note book / manual with sketches, circuits, programme, reading and calculation written by the students manually depends upon the practical subject during practical classes should be evaluated properly during the practical class hours with date.
- The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 10 marks for each exercise as per the above allocation.

At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks).

- Only regular students, appearing first time have to submit the duly signed bonafide record note book/file during the Practical Autonomous Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.

The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical subject.

6. Communication Skill Practical, Computer Application Practical and Physical Education:

The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the Communication skill and ICT skill of students.

As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports.

7. Project Work and Internship:

The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

a) Internal assessment mark for Project Work & Internship:

Project Review 1	:10 marks
Project Review II	: 10 marks
Attendance	: 05 marks (Award of marks same as theory subject pattern)
TOTAL	**: 25 Marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Autonomous Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Internship in Autonomous Examinations:

Demonstration/Presentation/Viva voce	:25 marks
Report	:25 marks
Writtent test	:30 marks
Internship Report	:20 marks
TOTAL	**: 100* marks**

*Examination will be conducted for 100 marks and will be converted to 75 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year “Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Autonomous examination.

8. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

9. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved byAICTE and affiliated to the State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than 40% in Theory subjects and 50% in practical subjects out of the total prescribed maximum marks including both the Internal Assessment and the Autonomous Examinations marks put together, subject to the condition that he/she secures at least a minimum of 40 marks out of 100 marks in the Autonomous Theory Examinations and a minimum of 50 marks out of 100 marks in the Autonomous Practical Examinations.

10. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2023 onwards (Joined first year in 2020 -2021) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:

A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:

All other successful candidates will be declared to have passed in Second Class.

The above classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2023 /April 2024 onwards (both joined First Year in 2020 -2021)

11. Duration of a period in the Class Time Table:

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as7 hours corresponding to 7 periods of instruction (Theory & Practical).

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TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (AUTONOMOUS), MADURAI- 11

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

CURRICULUM OUTLINE

THIRD SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4973310	Basic Organic Chemistry	4	-	-	4
4070320	General Engineering	5	-	-	5
4973330	Polymer Science	4	-	-	4
4973340	Polymer Engineering Drawing Practical	-	-	5	5
4973350	Polymer Science Practical	-	-	5	5
4070360	General Engineering Practical	-	-	4	4
4973370	Computer Aided Design Practical	-	-	5	5
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**13**	**-**	**19**	**35**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (AUTONOMOUS), MADURAI- 11

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

CURRICULUM OUTLINE

FOURTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4973410	Thermoplastic Materials	4	-	-	4
4973420	Plastics Processing I	4	-	-	4
4973430	Basics of Chemical Engineering and Process Measurement	4	-	-	4
4973440	Thermoplastics Preparation Practical	-	-	5	5
4973450	Plastics Identification Practical	-	-	5	5
4973460	Plastics Processing I Practical	-	-	5	5
4973470	Chemical Engineering and Process Measurement Practical	-	-	5	5
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**12**	**-**	**20**	**35**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (AUTONOMOUS), MADURAI- 11

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

CURRICULUM OUTLINE

FIFTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4973510	**Specialty and Thermosetting Materials**	**4**	**-**	**-**	**4**
4973520	**Plastics Processing - II**	**4**	**-**	**-**	**4**
4973530A 4973530B 4973530C	**ELECTIVE THEORY I:** **1. FRP Technology** **2. Plastics Waste Management** **3. Plastics Recycling**	**4**	**-**	**-**	**4**
4973540	**Entrepreneurship and Startup**			**4**	**4**
4973550	**Thermosets Preparation Practical**	**-**	**-**	**5**	**5**
4973560	**Plastics Processing – II Practical**	**-**	**-**	**6**	**6**
4973570A 4973570B 4973570C	**ELECTIVEPRACTICAL I:** **1. FRP Technology Practical** **2. Plastics Waste Management Practical** **3. Plastics Recycling Practical**	**-**	**-**	**5**	**5**
Co-curricular activities	Physical Education	-	-	-	2
	Library	-	-	-	1
	TOTAL	**12**	**-**	**20**	**35**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (AUTONOMOUS), MADURAI- 11

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

CURRICULUM OUTLINE

SIXTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4973610	**Plant Engineering and Management**	5	-	-	5
4973620	**Testing of Plastics**	5	-	-	5
4973630A	**ELECTIVE THEORYII:** **1. Plastics Mould and Die Design** **2. Packaging Technology** **3. Plastics Product Quality Control Management**	5	-	-	5
4973630B					
4973630C					
4973640	**Plastics Testing Practical**	-	-	-	6
4973650A	**ELECTIVEPRACTICALII:** **1. Plastics Mould and Die Design Practical** **2. Packaging Technology Practical** **3. Polymer Product Quality Control Practical**	-	-	-	5
4973650B					
4973650C					
4973660	**Project Work and Internship**	-	-	6	6
Co-curricular activities	Physical Education	-	-	5	2
	Library	-	-	6	1
	TOTAL	**15**	**-**	**17**	**35**

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (AUTONOMOUS), MADURAI- 11

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

N - 20-SCHEME

(Implemented from the Academic year 2021-2022 onwards)

CURRICULUM OUTLINE

SEVENTH SEMESTER (FULL TIME)

Subject Code	Subject Name	Hours Per Week			
		Theory	Drawing	Practical	Total
4973710	**Industrial Training and Viva Voce**	-	-	-	-

EQUIVALENT SUBJECTS IN N20 SCHEME FOR TNP2 SCHEME

' TNP 2' - SCHEME			' N 20'- SCHEME	
Course Code	**Course Name/Subject**	**Term**	**Equivalent Course code**	**Equivalent Subject**
16631	Basic Organic Chemistry	III	4973310	Basic Organic Chemistry
16632	Basics of Electrical and Electronics Engineering	III		No Equivalent
16633	Basics of Mechanical Engineering	III		No Equivalent
16634	CAD Practice	III	4973370	Computer Aided Design Practical
16635	Electrical and Electronics Engineering Practical	III		No Equivalent
16636	Tool room practical	III		No Equivalent
16637	Computer Application Practical	III		No Equivalent
16641	Polymer Science	IV	4973330	Polymer Science
16642	Thermo plastic Materials	IV	4973410	Thermo plastic Materials
16643	Plastics Processing I		4973420	Plastics Processing I
16644	Chemical Process Instrumentation and Control	IV		No Equivalent
16645	Polymer Science Practical	IV	4973350	Polymer Science Practical
16646	Plastics Preparation Practical	IV	4973440	Thermoplastics Preparation Practical
16647	Chemical Process Measurement and Control Practical	IV		No Equivalent
16646	Chemical Engineering Practical	IV		No Equivalent
16651	Specialty and thermosetting materials	V	4973510	Specialty and Thermosetting Materials
16652	Plastics processing - II	V	4973520	Plastics Processing - II
16653	Chemical Engineering	V		No Equivalent
16654.A	Composites Technology	V	4973530A	FRP Technology
16654.B	Plastics Waste Management	V	4973570B	Plastics Waste Management
16655	Communication and Life Skill Practical	V		No Equivalent
16656	Chemical Engineering Practical	V		No Equivalent
16657	Plastics Processing Practical	V		No Equivalent
16661	Plant Engineering and Management	VI	4973610	Plant Engineering and Management
16662	Testing of plastics	VI	4973620	Testing of Plastics

16663.A	Plastics Mould and Die Design	VI	4973630A	Plastics Mould and Die Design
16663.B	Packaging Technology	VI	4973630B	Packaging Technology
16664	Plastics Testing Practical	VI	4973640	Plastics Testing Practical
16665	Computer Aided Mould Design Practical	VI		No Equivalent
16666	Mould Making Practical	VI		No Equivalent
16667	Project Work	VI	4973660	Project Work and Internship
16671	Industrial Training Report and Viva Voce	VII	4973710	Industrial Training and Viva Voce

III SEMESTER

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY
Subject Code : 4973310
Semester : III Semester
Subject Title : **BASIC ORGANIC CHEMISTRY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
BASIC ORGANIC CHEMISTRY	**6 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	CLASSIFICATION, NOMENCLATURE AND PURIFICATION OF ORGANIC COMPOUNDS	12
II	ISOMERISMAND TYPES OF ORGANIC REACTIONS	12
III	HYDRO CARBONS AND ALCOHOLS	11
IV	CARBONYL COMPOUND SANDAMINES	11
V	AROMATIC COMPOUNDS	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

Organic chemistry is the branch of chemistry that deals with the structure, properties, and reactions of compounds that contain hydrocarbon. It is a highly creative science. Chemists in general and organic chemists in particular can create new molecules never before proposed which, if carefully designed, may have important properties for the betterment of the human experience.

Beyond our bodies' DNA, peptides, proteins, and enzymes, organic compounds are all around us and in industries such as the rubber, plastics, fuel, pharmaceutical, cosmetics, and detergent, coatings, dyestuffs, and agrichemicals industries. Clearly, organic chemistry is critically important to our high standard fliving.

There is tremendous excitement and challenge in synthesizing a molecule never before made synthetically or found in nature. Tailoring the properties of that molecule via chemical synthesis to produce beneficial effects to meet the needs of the present and future human existence is both challenging and rewarding.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able,

- To learn about the classification of the organic compounds.
- To know about the different methods of purification of the organic compound.
- To understand the different types of isomerism.
- To study about the different types of organic reactions.
- To know about the methods of preparation, properties and uses of basic organic compounds required for the preparation of polymer.
- To distinguish between primary, secondary and tertiary a mine.
- To learn method of separation of primary, secondary and tertiary a mines.
- To learn about the fractional distillation of coal tar and the various fractions.

BASIC ORGANIC CHEMISTRY

Content: Theory

Unit	Nameofthe Topic	Hours
I	**CLASSIFICATIONANDPURIFICATIONOFORGANICCOMPOUNDS** Classification of organic compounds - Alkane, Alkene, Alkyne, alcohol(Monohydric, dihydric and trihydric) and amine (primary, secondary and tertiary)-Purification of organic compounds-Principles of crystallization, sublimation, simple distillation, fractional distillation and Column chromatography.	**12 Hrs**

II	**ISOMERISMANDTYPESOFORGANICREACTIONS** Isomerism - structural isomerism - chain isomerism, position isomerism, functional isomerism, metamerism and automerism (Ketonolt automerism only) - Stereoisomerism - optical isomerism (Lactic acid only)-Geometrical isomerism(Maleic acid and Fumaric acid). Types of organic reactions-I-Electrophile and nucleophile-Examples -Substitution reactions-Addition reaction-Addition inolefinic compounds - Markonikoff's Rule - Peroxide effect - Elimination reaction(MechanismofE2andE1types are not included)	**12 Hrs**
III	**HYDROCARBONSANDALCOHOLS** Preparation methods, properties and uses of METHANE, ETHANE METHANOL (from water gas and by oxidation of CH4). ETHANOL (from ethylene, molasses and starch), GLYCEROL (from fats and oils and from propylene)	**11 Hrs**
IV	**CARBONYLCOMPOUNDSANDAMINES** General methods of preparation, properties and uses of FORMALDEHYDE, ACETONE, ACETIC ACID, and AMINES (Primary secondary and tertiary amine) - Difference between primary, Secondary and tertiary amines - Separation of primary, secondary and tertiary amines by Hoffmann method..	**11 Hrs**
V	**AROMATICCOMPOUNDS** Coaltar-Fractionaldistillationofcoaltar-Differentproductsandtheir uses - Commercial preparation of benzene from (i) coal tar and (ii)Petroleum-Properties of benzene.	**11 Hrs**

TextBooks:

1. B.S.Bahland ArunBahl -TextbookoforganicChemistry
2. P.L.SoniandH.M.Chawla-TextbookoforganicChemistry

ReferenceBooks:

1. K.S.TewariS.N.MehrotraandN.K.Vishnoi -Textbookoforganicchemistry
2. B.K.Sharma, G.P.PokhariyalandS.K.Sharma.- Organic Chemistry-Vol-IandII
3. S.P.ShuklaandG.L.Trivedi-ModernOrganicChemistry
4. +1and +2Chemistry-Tamil Nadu TextbookCorporation.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY
Subject Code : 4070320
Semester : III Semester
Subject Title : **GENERAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
GENERAL ENGINEERING	**5 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	STRENGTH OF MATERIALS AND METROLOGY	12
II	LATHE AND DRILLING MACHINES	12
III	MILLING AND GRINDING MACHINES	11
IV	ELECTRICITY AND ELECTRICAL DISTRIBUTION SYSTEM	11
V	ELECTRICAL TRANSMISSIONS	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

The subject allows the students to gain knowledge in understanding the various mechanical properties of materials, Lathe, drilling, milling and grinding machines, Electrical Distribution systems and Electrical Transmissions.

OBJECTIVES:

On completion of this subject, the students can able to understand the following concepts:

- Various Mechanical properties of the materials and types of stresses.
- Understand the measuring techniques.
- Understand the construction and working of lathe, Lathe, drilling, milling and grinding machines.
- Importance of Electrical Distribution system.
- Importance of Electrical Emergency systems.
- Importance of Electric motor and it's working principle.
- Importance of D.C.Generator and it's working principle.

DETAILEDSYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**STRENGTH OF MATERIALS AND METROLOGY** Simple stresses and strains - types of stresses - tensile and compressive stresses - Elasticity - Elastic limit - Hook's law - Modulus of elasticity, Linear and lateral strains - Poisson's ratio - Factor of safety - volumetric strain - bulk modulus - shear stresses - shear modulus - Young's modulus Precision linear measuring instruments - Vernier caliper – Vernier Height gauge, External Micrometers-Internal micrometers- Depth micrometers. Precision Angular measuring instruments Bevel protractor, Sine bar, Sprit level. Gauges-Feeler gauges-Limit gauges-Plug gauges-Ring gauges-Snap gauges, Slip gauges, Comparators – Types of comparators - Mechanical comparators - dial gauges only. Surface plate and its accessories.	**12 Hrs**

II	**LATHE AND DRILLING MACHINES** **Lathe:** Types of lathes –Principle parts-Head stock – Back geared type – All geared type – Tumbler gear mechanism – Apron mechanism – Carriage cross slide – Automatic, Longitudinal and Cross feed mechanism – Tail stock and its function, Work holding devices - Face plate -3 jaw chuck - 4 jaw chuck - Catch plate and carrier – Types of centers. Machining operations done on lathe, Lathe attachment – Tool post grinder – Milling attachment, Methods of taper turning, Thread cutting, Cutting speed - Feed - Depth of cut . **Drilling** Types of drilling machines - Bench type – Floor type - Pillar drilling machine -Radial drilling machine – Gang drilling machine –Multi spindle type. Specifications, Drilling tools-Flat drill-Twist drill-Nomenclature of twist drill, Methods of holding drill bits - Drill chucks - Socket and sleeve, Drilling operations–drilling - reaming - counter sinking - counter boring - spot facing – tapping, Cutting speed and Feed.	**12Hrs**
III	**MILLING AND GRINDING MACHINES** **Milling** Types of milling machines, Column and knee type- plain milling machine-Universal milling machine and Vertical milling machine. Specification of milling machines, Principles of operation, Work holding devices, Tool holding devices-Standard Arbor – Stub arbor-Adapter, Spring collet, Milling cutters –Plain- slab- slitting saw- side-Angle-End- Tslot, wood - ruff key, Fly cutter and Form milling cutters. Nomenclature of plain milling cutter. Milling process - Conventional milling and climb milling, Milling operations- straddle and gang milling – Vertical milling attachment. **Grinding:** Classification of Grinding machines, Specifications, Rough grinders – Floor stand grinders- Bench grinders- Portable grinder – Belt grinders- Precision grinders – Cylindrical grinder - Plain and universal grinder - Center less grinder, Internal grinder-Chucking type-Planetary type-Centreless type, Surface grinder- Reciprocating table with horizontal spindle- Rotary table with horizontal spindle- Reciprocating table with vertical spindle- Rotary table with vertical spindle. Grinding wheels	**11Hrs**
IV	**ELECTRICITY AND ELECTRICAL DISTRIBUTION SYSTEM.** Definition the following terms: Electricity- Voltage- Voltmeter- Ampere-Ammeter-watts- wattmeter- Ohms. Statement of Ohm's Law- simple problems in Ohm's Law. Grounding and the purpose of grounding the motors and equipments. Types of current- AC Current & DC current- comparison of AC & DC current. Electrical Distribution systems: Transformers- Motor Control Centers (MCC) - Fuses- Circuit breakers- Switch. (Functions of the above with brief description).	**11**

V	**ELECTRICAL TRANSMISSIONS** Electric motor- purpose of electric motor- D.C motor- principle and characteristics of D.C Motor- Synchronous motor and Induction motor- construction and working principle of D.C electric motor. Electric motors and maintenance: Starting the motor, motor vibration, temperature and lubrication, cleaning and ventilation & overload motors. D.C Generator- Principle, construction and working of D.C Generator.	**11**

Reference Books:

1. Theory of Mechanics by R.SKhurmi- EurasiaPublishingHouse.
2. Mechanical Technology by R.S.Khurmi - S.Chand and Co., 1988
3. Workshop Technology Vol I &Vol II – HajraChoudhury
4. Production Technology - O.P. Khanna
5. AtextbookofElectricaltechnologyVol.1andVol.2byB.L.Theraja,S.Chandpublishers.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973330

Semester : III Semester

Subject Title : **POLYMER SCIENCE**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
POLYMER SCIENCE	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	CHEMISTRY OF POLYMERISATION	12
II	COPOLYMERISATION AND POLYMERISATION TECHNIQUES	12
III	POLYMER MOLECULAR WEIGHTS & POLYMER SOLUTIONS	11
IV	STRUCTURE OF POLYMER, POLYMER CRYSTALLISATION & GLASS TRANSITION TEMPERATURE	11
V	POLYMER REACTIONS AND RHEOLOGY	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

It gives the student the knowledge of basic polymerization chemistry and their significance in polymer industries. With this information student can understand the structure of polymers and their effect on properties.

OBJECTIVE:

On completion of the units of syllabus contents the students will be able

- To understand the basic terminologies in Polymer chemistry.
- To appreciate the kinetics behind each polymerisation reactions.
- To understand the various polymerization techniques.
- To identify the factors influencing glass transition temperature
- To understand the theory behind polymer crystallization.
- To identify the types of degradation and polymer reactions.

POLYMER SCIENCE

Content: Theory

Unit	Name of the Topic	Hours
I	**CHEMISTRYOFPOLYMERISATION** Evolution of polymers – Definition of Monomer, Polymer , Polymerisation and Degree of polymerisation – Newtonian vs Non Newtonian fluid - Classification of polymers – Based on Chemical microstructure – Basedongeometricalmicrostructure- ChainpolymerisationvsSteppolymerisation- ChainPolymerisation:FreeRadicalpolymerisation-Initiation – Propagation – Termination by disproportionation and chaintransfer-Inhibitors- Ionicpolymerisation:Cationicpolymerisation-Anionicpolymerisation- CoordinationpolymerizationwithZiegler-Natta as catalyst - Step polymerisation: Polycondensation polymerisation –Polyaddition polymerisation –Ringopening polymerization	**12 Hrs**

II	**POLYMERISATIONTECHNIQUESANDKINETICS** Polymerisation techniques:Bulk polymerisation-Solution polymerisation -Suspensionpolymerisation-Emulsionpolymerisation-MeltPolycondensation-SolutionPolycondensation-InterfacialPolycondensation - Kinetics of polymerisation (Initiation, Propagation andtermination):Freeradicalpolymerisation-Cationicpolymerisation-Anionic polymerisation-Polycondensationpolymerisation with non-catalyzed andacidcatalyzed.	**12 Hrs**
III	**POLYMERMOLECULARWEIGHTS&ITSDETERMINATION** Polymer molecular weight concept: Number average concept – Weight average concept -Polydispersity and molecular weight distribution in polymers - Molecular weight determination : Cryoscopy – Ebulliometry – Osmometry: Membrane and Vapour pressure osmometry – Viscometry:OstwaldandUbbelohdeViscometry-Endgroupanalysis-Ultracentrifugation-SedimentationVelocitymethod-Lightscattering method-Polymerfractionation:GelpermeationChromatography.	**11 Hrs**
IV	**POLYMERSOLUTION,POLYMERCRYSTALLISATION&GLASSTRANSITIONTEMPERATURE** Polymersolutions**:**The process of polymer dissolution-Effect of molecular weight on solubility-Polymercrystallization:Amorphouspolymer vs Crystalline polymers - Degree of crystallinity – Crystallinity vs Crystallisability – Crystal vs Crystallites - Effect of crystallinity on the properties of polymers – Glass transition temperature: Definition of Tg – factors influencing the glass transition temperature-Determination of Glass transition temperature-Dilatometer method	**11 Hrs**
V	**POLYMERDEGRADATIONANDREACTIONS** Polymerdegradation:Types of degradation- Thermal degradation, Mechanical degradation, Photo degradation, Oxidative degradation and Hydrolytic degradation. Polymer reaction: Hydrolysis - Acidolysis - Aminolysis_ Hydrogenation -CrossLinkingreactions(Vulcanisationof elastomer with sulphur and with non sulphuragent and Cure reactions of Novolacresin).	**11 Hrs**

TextBooks:

1. V.R.Gowarikar,N.V.Viswanathan&JayadevSridhar-PolymerScience - Newageinternationalpublishers – 1986,Reprint-2011.
2. FredW.Billmeyer - TextBookofPolymerScience-WileyInterscience-1971.

ReferenceBooks:

1. Anilkumar&S.K.Gupta -Fundamentals of Polymer Science - Tata McGraw Hill Pub.Co. 1978.
2. Odian.G-Principlesof Polymerisation– McGraw-Hill, NewYork –1970
3. Blackley& Halsted - Emulsion Polymerisations: Theory and Practice - McGraw-Hill,NewYork -1975
4. MuruganN-FundamentalsofPolymerScience-StudyMaterial
5. I.HermanS.Haufman and Joseph J.Falce - Introduction to Polymer Science andTechnology-WileyInterSciencePublications-1977.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973340

Semester : III Semester

Subject Title : **POLYMER ENGINEERING DRAWING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
POLYMER ENGINEERING DRAWING PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

Diploma Holders are required to read and interpret drawings. Therefore it is essential that they have competency in preparing drawings and sketches of various parts. Therefore this subject is essentially required. Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility.The course is aimed at developing basic graphic skills so as to enable them to use.

OBJECTIVES:

Oncompletionoftheexperimentsgiveninthesyllabusthestudentswillbeable

- To draw the different views of a solid polymer specimen
- To depict the sectional views of parts the mould
- To draw the sectional views of assembled mould
- To draw the sectional view of polymer products

POLYMER ENGINEERING DRAWING

SECTIONAL VIEWS (THEORYONLY): 15 hours

Need for sectioning - cutting plane - Section lines - Types of Sections - Full Section – Half Section - Removed Section - Revolved Section - Partial Section - Off set Section – Section in gofthinand large-Marking Dimensions

SOLIDSPECIMEN: 15hours

Top, Front and Side view of the following:

1. Dumb bell specimen
2. Compression Button specimen
3. Flexural Specimen
4. Not chedIzod Specimen
5. Not chedCharpy Specimen

MOULDPLATE: 15hours

Full Sectional views of the following:

1. Top plate of single cavity tensiles lab-two plate mould
2. Bottom plate of single cavity tensiles lab-two plate mould
3. Top plate of multicavity compression button-two plate mould
4. Bottom plate of multicavity compression button-two plate mould

ASSEMBLEDPART: 15hours

Full Sectional views of the following:

1. Two plate single cavity tensiles lab mould
2. Two plate multicavity compression button mould

POLYMERPRODUCT: 20hours

Full Sectional views of the following:

1. O-Ring
2. V-belt
3. Simple Rubber Ball
4. Plastic medicine bottle
5. Plastic threaded cap

REFERENCEBOOKS:

1. Engineering Drawing by **P.K.Kapur and P.K.Sapra**- Tata McGraw - Hill PublishingCompanyLimited,NewDelhi-1990.

2. A Text Book of Machine Drawing by **P.S.Gill**- Kataria& Son Publishing House,NewDelhi-2010.

3. A Text Book of Machine Drawing by **N.D.Bhatt&V.M.Panchal -** Charotor Publishing,Anand -2011.

4. Mould Design Data Book by CIPET.

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	DrawingTable	30
2.	MiniDrafter	30

Reference:

1. Polymer Engineering Drawing Lab manual
2. Engineering Drawing and rapics – K.Venuopal, 5th edition, New Age InternationalPublisher,2004.

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973350

Semester : III Semester

Subject Title : **POLYMER SCIENCE PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
POLYMER SCIENCE PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education, skill development plays a vital role. This can be achieved by gaining the hands on training with various equipments relevant to their field ofstudy.Thisisaccomplishedbydoingpolymerrelatedexperimentsinpracticalclasses.

GUIDELINES:

All the Ten experiments given in the list of experiments should be completed and given for the end semester practical examination. In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory. The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations.

OBJECTIVES:

Oncompletionoftheexperimentsgiveninthesyllabusthestudentswillbeable

- To prepare the polymer solution
- To determine the molecular weight of PVC using K value
- To find the molecular weight of Polyester resin using hydroxyl value
- To prepare the polymers using various polymerization techniques

POLYMER SCIENCE PRACTICAL

LISTOFEXPERIMENTS

Determination of the following properties: -

1. Specific gravity using pychnometer
2. Specific gravity using an Instrumental method
3. Density
4. Swelling characteristics
5. Ash content.
6. Acid Value
7. Melting point
8. Gel time
9. Viscosity average molecular weight of polymers
10. Shrinkage of polymers
11. Moisture content of polymers.

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Hot air oven	1
2.	Electronic weighing balance	1
3.	Burette	5
4.	Ostwald Viscometer	5
5.	Magnetic Stirrer	5
6.	Conical flask	5
7.	Heating Mantle	5
8.	Round bottom flask	5
9	Liebig condenser	5
10.	Water bath	1

Reference:

1. Experimental Polymer science byV.R.Gowrikaret.al.,
2. Polymer science Lab Manual by CIPET

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4070360

Semester : III Semester

Subject Title : **GENERAL ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
GENERAL ENGINEERING PRACTICAL	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments, which are used to identify the strength of material, identify the parts of valves, and in handling electrical machineries and instruments. These will help to handle various equipments in process industries for a chemical engineer.

LISTOFEXPERIMENTS

LATHE SHOP:

1. Plain Turning
2. Step Turning
3. Tapper Turning
4. Knurling

SPECIAL MACHINES:

1. Milling
2. Drilling (radial only)

EEE :

1. Determination of Unknown Resistance by ohms law.
2. Energy measurement in a single phase circuit using Lamp load.
3. Load test on a single phase transformer.
4. Verification of Series and parallel circuit.

LIST OF EQUIPMENTS

1. Lathe
2. Drilling Machine
3. Milling Machine
4. Rheostat of various range
5. Ammeters(MC and MI)of various ranges
6. Voltmeters(MC and MI)of various ranges
7. Wattmeter-300v/5A-2.5A/UPF
8. Energymeter-300v/5A

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973370

Semester : III Semester

Subject Title : **COMPUTER AIDED DESIGN PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
COMPUTER AIDED DESIGN PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education, design skills development plays a vital role. These can be achieved by using drawing software. This is accomplished by sketching Polymer related parts using Auto CAD.

Objectives:

Oncompletionoftheexperimentsgiveninthesyllabusthestudentswillbeable

- To use the tools and commands of AutoCAD software to draw the various views of a part.
- To mark the dimensions of the drawing
- To draw the sectional views of the polymer specimen
- To draw the sectional views of the two plate polymer specimen mould

COMPUTER AIDED DESIGN PRACTICAL

LIST OF EXPERIMENTS **(80Hours)**

Introduction - Applications - Advantages over manual drafting - Software requirements - windows desktop - AutoCAD screen interface - menus - toolbars - How to start AutoCAD - commandgroups-Howtoexecutecommand-typesofcoordinatesystems-absolute-relative-polar. Creating objects (2D) – using draw commands - Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Pline, sketch, Trace- creating2Dsolid.

Creating Text- dtext, mtext,textstyle- Mline, Spline - Drawing with precision - Osnapoptions – drafting setting- Limits – Units-drawing aids- Fill, Snap, Grid, Ortho lines- Function keys. Editing and Modify commands - object selection methods - erasing object –oops- canceling and undoing a command - copy - move - array -offset - scale - rotate - mirror – break- trim - extend –explode.

Divide - measure - stretch - lengthen - changing properties - color -Line types –Ltscale-Matching properties-editing with grips-Pedit –ddedit-mledit.
Controlling the drawing display - blipmode -view group commands- zoom redraw, regen, regen auto, pan, viewers-real time zoom. Creation of blocks - Wblock- inserting a block - block attributes- hatching –pattern types-boundary hatch-working with layers. Basic dimensioning - editing dimensions - dimension styles - dimensioning system variables. Isometric Drawing - Isometric projection - Drawing Isocircles - Dimensioning Isometric objects. File commands –file import and export-plotting drawing - external references - 3Dfundamentals-2D to3D conversion.

S.No.	Topics	Hrs
1.	Introduction	4
2.	Draw Group commands, Osnap options, Drafting setting andFunctionkeys	2
3.	CommandsPractice	2
4.	Edit and Modify Group commands, Pledit, Text edit	2
5.	Commands Practice	2
6.	Viewgroups, Inquiry, Block commands	2
7.	Commands Practice	2
8.	Hatching, Layer, colorand line types	2
9.	Commands Practice	2
10.	Creating Isometric Drawing	2
11.	Isometric Drawing Ex. Practice	2
12.	File commands, Plotting, External reference	2
13.	3DFundamentals	4

14.	Simple Mould Drawings(in2Donly)- i. Dumb bell specimen ii. Compression button iii. Not chedIzod specimen iv. Not chedCharpy specimen	25
15.	Simple Mould Drawings(in2Donly)- ii. Two platesing lecavityTensiles lab mould iii. Two plate multicavity compression button mould	25

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Computers with atleast P4 Configuration	30
2.	AutoCAD 2007 & above software	1

Note: Software lower than version AutoCAD2007should not be used.

Reference:

1. Computer Aided Design Lab manual.

IV SEMESTER

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973410

Semester : IV Semester

Subject Title : **THERMO PLASTIC MATERIALS**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
THERMO PLASTIC MATERIALS	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	POLYOLEFINS AND STYRENICS PLASTICS	12
II	VINYL PLASTICS, ACRYLIC PLASTICS	12
III	ENGINEERING PLASTICS	11
IV	CELLULOSE PLASTICS, ACETAL RESIN & SATURATED POLYESERS	11
V	THERMOPLASTIC ELASTOMERS	11
	Test & Model Exam	7
TOTAL		**64**

DETAILED SYLLABUS

UNIT	TOPIC	TIME(Hrs)
I	**POLYOLEFINS AND STYRENICS PLASTICS** Plastics - Classifications - Abbreviations. Polyethylene - types –Method of Manufacturing of Low Density Polyethylene by high pressure process, High Density Polyethylene by Phillips process - structure properties and applications. Polypropylene - types – structure - Method of Manufacturing by Ziegler process - properties and applications. Polystyrene – structure - Method of Manufacturing by continuous bulk polymerisation process - properties and applications - Styrene copolymers: HIPS, SAN and ABS – their structure, properties and applications.	**12**
II	**VINYL PLASTICS, ACRYLIC PLASTICS** Polyvinyl chloride – Method of Manufacturing of PVC-structure - Types: soft and rigid PVC - properties and applications - VC copolymers - applications. Method of Manufacturing of Polyvinyl alcohol – structure – properties and applications. Acrylic plastics: Method of Manufacturing Polymethyl methacrylate (PMMA) - by Suspension polymerisation - structure, properties and applications	**12**
III	**ENGINEERING PLASTICS** Polyamides - Method of Manufacturing, Properties and applications of Polyamide 6, and Polyamide 6,6 Acetal resins - Method of Manufacturing, structure, properties and applications - Method of Manufacturing of Polycarbonate - structure, properties and applications	**11**
IV	**CELLULOSE PLASTICS, FLUORO PLASTICS,& SATURATED POLYESTERS** Cellulose plastics: Method of Manufacturing of cellulose acetate and cellulose acetate butyrate, cellulose nitrate – their structure - properties and applications. Fluoro Plastics : PTFE – Method of manufacturing – Properties – Applications - Method of Manufacturing of Polyethylene terephthalate (PET) and Poly butylene terephthalate (PBT) their structure, properties, and applications.	**11**
V	**THERMO PLASTIC ELASTOMERS** Basic structure,Method of Manufacture, Commercial grade and applications – Thermoplastic styrene block copolymers, Polyester thermoplastic elastomers, Polyamide thermoplastic elastomers, Polyurethane thermoplastic elastomers.	**11**

Text Books:

1. J.A. Brydson - Plastic Materials –7th Ed-Butterworths-Heinemann–London (1999)
2. D.C. Miles, J.H. Briston - Polymer Technology – Chemical Publishing Co.-New York (1972)
3. Robert V.Milby - Plastics Technology - McGraw Hill Book Co. - 1973.

Reference Books:

1. A.S.Athalye-Plastics Materials Handbook Vol I & II-Multi-tech Publishers (2002)
2. Gachter / Muller - Plastics Additives (4th ed) – Hanser Publishers (1996).
3. W.C.Wake - Fillers for Plastics – Iliffe, London (1971)
4. H.V.Boenig - Polyolefins: Structure and Properties – Elsevier (1986)
5. W.S.Penn - P V C Technology –Applied science, London (1991)
6. Murugan N - Understanding Plastics materials – GES Publications (2007).
7. Geoffrey Pritchard - Plastics Additives – Chapmann& Hall (1998).
8. S.Schwartz&H.Goodman - Plastics Material and Processes - Van Nostrand Reinhold Co. - 1982.
9. J.Harry Dubois & Frederic W.John - Plastics - Van Nostrand Reinhold Co. - 1981.

W.S.Penn - P V C Technology – Applied Science, London – 1971.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973420

Semester : IV Semester

Subject Title : **PLASTICS PROCESSING-I**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS PROCESSING-I	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	COMPRESSION AND TRANSFER MOULDING	12
II	INJECTION MOULDING	12
III	BLOW MOULDING &THERMOFORMING	11
IV	ADVANCED PLASTIC PROCESSING	11
V	CALENDERING	11
	Test & Model Exam	7
TOTAL		**64**

DETAILED SYLLABUS

UNIT	TOPIC	TIME(Hrs)
I	**COMPRESSION AND TRANSFER MOULDING** **Compression moulding:**Introduction to compression moulding process – Compression moulding cycle- Bulk factor - Curing time - Flow properties - Preheating and preforming- Types of compression moulding press-up and down- Types of mould – open flash-positive type-semi positive type- Trouble shooting – Advantages and Limitation of compression moulding process. **Transfermoulding:** Basic principle of transfer moulding process – Transfer moulding cycle-Types of transfer moulding process - Pot type-Plunger type-top plunger –bottom plunger-Advantages and Limitations of transfer moulding process - Comparison of transfer moulding process with compression moulding process.	**12**
II	**INJECTION MOULDING** Basic principles of injection moulding process and moulding materials-Types of injection moulding machine- plunger type-Single stage - Two stage-Screw type machines – reciprocating type-non reciprocating type. **Plasticizing unit:**Construction of plasticizing unit (injection unit) –Screw-Design features of screw - Types of screw- general purpose screw-PVC screw- Barrel- types of barrel –standard barrel-venting barrel- Barrel and screw materials - Nozzle – Types of nozzle- standard – Reverse taper – Shut off nozzle– Non return valve **Clamping Unit:**Clamping unit – Types of clamping system - Toggle clamping - Hydraulic clamping – merits and demerits- Shot capacity – Injection rate - Plasticizing capacity. Specification of injection moulding machine.	**12**
III	**UNIT III: BLOW MOULDING &THERMOFORMING** **Blow Moulding:**Basic principles of blow moulding- process and materials – Types- Extrusion blow moulding process - Injection blow moulding process - Stretch blow moulding process- injection stretch –extrusion stretch. Production of parison- Parison programming- Advantages and limitations of blow moulding process - Trouble shooting. **Thermoforming:**Basic principle of thermoforming - Thermoforming materials - Mould and mould materials-Heating sources - Radiant - Contact heating - - Draw ratio of sheet. Thermoforming techniques-Vacuum forming - Plug assist forming - Drape forming - Bubble or blister forming - Snap back forming-Advantages and limitations of thermoforming - Trouble shooting.	**11**
IV	**ADVANCED PLASTIC PROCESSING** Basic principles, process and application of- thermoset injection moulding- Gas Assisted Moulding- Sandwich Moulding- - Liqiud Injection Moulding- Injection Compression Molding(Coining)- Multilevel feed injection moulding.	**11**

V	**UNIT V: CALENDERING** **Calendering:** Basic principles of calendering process and materials - Types of canlenders - Super imposed calendar –- 5 roll calendar - 4 roll calender- Offset calendar- 3 roll and 4 roll calender - Z type calendar- 3 roll and 4 roll calender - Inverted L type calendar. Nomenclature of calendering machine-Temperature control of calender rolls - Cored rolls - Peripherally drilled rolls - Manufacturing of PVC calendered sheets - controlling of Sheets thickness-Gauge control- crowning effect-Nip roller cambering- Crowning effect –Wall thickness controlling methods- Contour grinding - Cross axis bending-roll bending - Application and limitation of calendering process.	**11**

REFFERENCES:

1. Plastic Technology - William. J. Patton
2. Polymer Processing - D.H. Marton., Jones
3. Injection Moulding - A.S. Athalye
4. Practical Injection Moulding of Plastics - Walter Mink
5. Injection Moulding - Irvin Rubin
6. Injection Moulding - Rosato
7. Plastic Processing Technology - Edward. A. Maccio
8. Blow Moulding Handbook – Rosato
9. Calendering of Plastics - Griffia., R.A. Elden

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973430

Semester : IV Semester

Subject Title : **BASICS OF CHEMICAL ENGINEERING AND PROCESS MEASUREMENT**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
BASICS OF CHEMICAL ENGINEERING AND PROCESS MEASUREMENT	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	HYDROSTATICS AND FLUID MECHANICS – PUMPS AND HYDRAULIC APPLIANCES	12
II	HEAT TANSFER	12
III	BASIC CONCEPT OF MEASUREMENT, MEASUREMENT OF TEMPERATURE , PRESSURE AND FLOW	11
IV	RHEOLOGICAL MEASUREMENT	11
V	AUTOMATIC AND COMPUTERIZED PROCESS CONTROL	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

A Chemical Engineer during his/her professional career primarily works in industries manufacturing various chemical products. It is therefore necessary to provide information to Chemical Engineering students about new materials, chemicals involved and manufacturing process of some important and frequently used chemical products.

OBJECTIVES:

On Completion of the units of Syllabus contents the students will be able,

- To explain the behavior of the fluid and its mechanics.
- To determine the flow behavior using a suitable method.
- To distinguish the various modes of heat transfer
- To appreciate the principle behind heat exchange process
- To select a suitable instrument to measure the temperature and pressure
- To distinguish the various modes of control actions

Basics of Chemical Engineering and Process Measurement

Contents:Theory

Unit	Name of the Topic	Hours
I	**HYDROSTATICS ANDFLUIDMECHANICS - PUMPSANDHYDRAULICAPPLIANCES , VALVES** Properties of fluids- density- specific weight- specific volume- specific gravity- vapour pressure. Pressure- fluid pressure - Pascal's law of Transmissibility –Atmospheric pressure-Gauge pressure-Absolute pressure. Flow of fluids- Laminar flow- Turbulent flow –Newtonian and Non-Newtonian fluids -viscosity - Kinematic viscosity - Bernoulli's Theorem Principle and Applications Pumps-Principle and working of a centrifugal pump- principle of gear pumps Major properties and types of hydraulic fluids – the construction and operation of hydraulic Press and hydraulic Jack	**12Hrs**
II	**HEATTANSFER** Conduction - Fourier's law - thermal conductivity - conduction through plane wall,Convection-natural convection-forced convection-Radiation-Kirchhoff's law-blackbody-Stefan Boltzmann law-Emissivity - grey body - heat transfer equipment- heat exchangers – 1-2 ,2-4heatexchangersconstructiondetails& Working	**11Hrs**

III	**BASIC CONCEPT OF MEASUREMENT, MEASUREMENT OF TEMPERATURE AND PRESSURE** Purpose of Instrumentation - Functional elements of Instruments – Static and Dynamic characteristics of Instruments - Signaling and Recording Instruments – Circular and Strip chart. Temperature measuring Instruments- Liquid and Gas filled Thermometer- Resistance Thermometer - Thermocouples – Optical Pyrometer. Pressure measuring Instruments - Bourdon gauge - Vacuum measurement - Ionization gauge. Electrical pressure Transducers - Strain gauge pressure Transducers	**12Hrs**
IV	**FLOW AND RHEOLOGICALMEASUREMENT** Flow measurement – construction, principle and working of orifice meter–venturimeter-Rotometer Rheologicalmeasurement -Working principle, Parts and functions of Parallel plate viscometer -Saybolt viscometer - Red wood viscometer - Coneandplateviscometer- MFItester.	**11Hrs**
V	**AUTOMATIC AND COMPUTERIZED PROCESS CONTROL** Process Variables - Block diagram, Principle and Purposes of Feedback, Feed forward control system- Pneumatic controllers with P ,I,D,PI,PD and PID control actions - Final control element - Application of automatic control in (1) Batch Reactor - control of Temperature and Pressure, (2) Heat Exchanger - control of Temperature and Flow Analog and Digital computers - conversion of Analog signal to Digital& vice versa - computer supervisory control – Distributed Control System (DCS) – working principle with block diagram	**11Hrs**

TextBooks:

1. W.L.McCabe&J.C.Smith - Unit Operations of Chemical Engg. - McGraw Hill Book Co.1985.
2. W.L.Badger&J.T.Banchero - Introduction to Chemical Engg. - McGraw Hill Book Co. - 1988.
3. R.S.Khurmi-HydraulicsandHydraulicappliances.
4. A Text Book of Chemical Process Instrumentation and Control by P.D.Kulkarni&D.B.Dhone, NiraliPraksham , 2017
5. Automatic Process Control by Donald P.Eckman, Sixth edition, Wiley Eastern Limited.,

ReferenceBooks:

1. RobertH.Perry- Perry'sChemicalEngg.HandBook -McGrawHillBookCo.
2. Process Modeling, Simulation and control for Chemical Engineers by Luyben, McGraw Hill Kogakasha Ltd.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973440

Semester : IV Semester

Subject Title : **THERMO PLASTICS PREPARATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
THERMO PLASTICS PREPARATION PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can beachievedbyexperienceinhandlingvariousequipment.Thisisaccomplishedbydoingpolymerpreparationrelatedexperiments in practical classes.

GUIDELINES:

- Alltheexperimentsgiveninthelistofexperimentsshouldbecompletedandgivenfortheendsemesterpracticalexamination.
- In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able,

- To prepare various thermoplastic polymers
- To analyse the composition thermoplastics
- To categorize the thermoplastics based on presence of elements

THERMO PLASTICS PREPARATION PRACTICAL

LIST OF EXPERIMENTS

Determination of the following properties:-

1. Preparation of PMMA by Bulk Polymerization
2. Preparation of PMMA by Solution Polymerization
3. Preparation PMMA by Suspension Polymerization
4. Preparation PMMA by Emulsion Polymerization
5. Solution polymerization of Acrylonitrile
6. Ring opening polymerization of Caprolactum
7. Interfacial polymerization of Nylon 6,6
8. Copolymerization of styrene and MMA
9. Preparation of PVC plastisol
10. Preparation of polystyrene

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR A BATCH OF30STUDENTS):

S.No.	Name of Equipment / Instrument	No.
1.	Polymer preparation and identification bench with burner facility	1
2.	Electronic weighing balance	1

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973450

Semester : IV Semester

Subject Title : **PLASTICS IDENTIFICATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS IDENTIFICATION PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can beachievedbyexperienceinhandlingvariousequipment.Thisisaccomplishedbydoingpolymerpreparationrelatedexperiments in practical classes.

GUIDELINES:

- All the experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able,

- To carry out the preliminary test to find to find the type of plastics
- To identify the given plastics accurately using element analysis method
- To differentiate the properties of the plastics.
- To classify the given plastics by chemical method

PLASTICS IDENTIFICATION PRACTICAL

Preliminary tests:

1. Preliminary Identification of plastics containing no elements
2. Preliminary Identification of Halogen containing plastics
3. Preliminary Identification of Nitrogen containing plastics

Element all Identification and Confirmatory test:

4. Identification of plastics containing no elements(anyone plastic)
5. Identification of oxygen containing plastics(anyone plastic)
6. Identification of Halogen containing plastics(any one plastic)
7. Identification of Nitrogen containing plastics(any one plastic)
8. Identification of Sulphur containing plastics(any one plastic)
9. Identification of Thermoset materials – Phenol Formaldehyde
10. Identification of Thermoset materials – Unsaturated Polyester Resin
11. Identification of plastics blend containing one or more element(any one plastic)

LISTOFEQUIPMENTS/INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR A BATCH OF 30 STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Polymer preparation table with electrical, tap and burner facility	2
2.	Electronic weighing balance	1
3.	Water bath	1

Reference:

1. Plastics Identification Lab manual

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973460

Semester : IV Semester

Subject Title : **PLATICS PROCESSING I PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
PLATICS PROCESSING I PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can beachievedbyexperienceinhandlingvariousequipment.Thisisaccomplishedbydoingpolymerpreparationrelatedexperiments in practical classes.

GUIDELINES:

- All the experiments given in the list of experiments should be completed and given for the end semester practical examination.
- In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory..
- The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations.

OBJECTIVES:

- This practical subject will impart the students the requisite practical knowledge in plastics processing.

- The students will acquire the practical skills to operate various polymer processing machines like
    1. Agitation & Mixing
    2. Blending
    3. Size reduction
    4. Injection moulding
    5. Blow Moulding
    6. Roto type Moulding

LIST OF EXPERIMENTS

Operation of the following processing machines: -

1. Agitator
2. Jaw crusher
3. Ball mill
4. Blender
5. Hand Injection Molding Machine
6. Hand Blow Molding Machine
7. Semiautomatic Pneumatic Injection molding Machine
8. Semiautomatic hydraulic Injection molding Machine
9. Roto Type Injection molding Machine
10. Fully automatic Injection molding Machine
11. Semi Automatic Blow Molding Machine

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR A BATCH OF 30 STUDENTS):

S.No.	Name of Equipment / Instrument	No.
1	Agitator	1
2	Jaw crusher	1
3	Ball mill	1
4	Blender	1
5	Hand Injection Molding Machine	1
6	Hand Blow Molding Machine	1
7	Semiautomatic Hydraulic Injection molding Machine	1
8	Semiautomatic Pneumatic Injection molding Machine	1
9	Roto Type Injection molding Machine	1
10	Fully automatic Injection molding Machine	1
11	Semi Automatic Blow Molding Machine	1

1. Processing Lab Manual by CIPET
2. Polymer Processing Lab Manual by D.H.Morton Jones

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973470

Semester : IV Semester

Subject Title : **CHEMICAL ENGINEERING AND PROCESS MEASUREMENT PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
CHEMICAL ENGINEERING AND PROCESS MEASUREMENT PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipment. This is accomplished by doing engineering related experiments in practical classes.

GUIDELINES:

- ❖ All the Ten experiments given in the list of experiments should be completed and given for the end semester practical examination.
- ❖ In order to develop best skills in handling Instruments/Equipment and taking reading in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.
- ❖ The external examiners are requested to ensure that a single experimental question should not be given to more than four students while admitted a batch of 30 students during Autonomous Examinations.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able,

- ❖ To determine the flow rate of the material using Orifice meter, Venturimeter and Rotameter
- ❖ To find out the pump efficiency of the Centrifugal pump
- ❖ To estimate the temperature using thermocouple and RTD module
- ❖ To determine the characteristics of control valve
- ❖ To study about different modes of action of Controllers using SCADA

BASICS OF CHEMICALENGINEERING AND PROCESS MEASUREMENT CONTROL PRACTICAL

LISTOFEXPERIMENTS

1. Study and operation on Orifice meter
2. Study and operation on Venturi meter
3. Study and operation on Rotameter
4. Study and operation on Centrifugal pump
5. Characteristics of Temperature sensor using Thermocouple module
6. Characteristics of Temperature sensor using RTD module
7. Study of ON- OFF controller using Temperature controller Trainer kit by monitoring the Process in SCADA mode
8. Study of ON- OFF controller using Level controller Trainer kit by monitoring the process In SCADA mode
9. Study of P, PI control using PID controller Trainer Kit by monitoring the process in SCADA mode
10. Study of PID control using PID controller Trainer Kit by monitoring the process in SCADA mode
11. Study of valve flow coefficients and inherent Characteristics of Linear, Equal % and quick opening

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR A BATCH OF 30 STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	Orificemeter	1
2.	Venturimeter	1
3.	Rotameter	1
4.	Centrifugalpump	1
5.	Temperature sensors like Thermocouple, RTD	1
6.	Pneumatic Control Valve (Linear, Equal %and Quick opening)setup	1
7.	Temperature Control Trainer kit with SCADA	1
8.	Liquid Level Control Trainer kit with SCADA	1
9.	Pressure Control Trainer kit with SCADA	1

REFERENCE BOOKS:

1. Chemical Engineering Manual by W.L.McCabe & J.C.Smith
2. Chemical Engineering Manual by W.L.Badger & J.T.Banchero

V SEMESTER

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973510

Semester : V Semester

Subject Title : **SPECIALTY AND THERMOSETTING MATERIALS**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
SPECIALTY AND THERMOSETTING MATERIALS	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	SPECIALIY AND HIGH PERFORMANCE PLASTICS	12
II	THERMOSETTING RESINS - I	12
III	THERMOSETTING RESINS - II	11
IV	COMPOUNDING	11
V	PLASTICS BLENDS & ALLOYS,	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

It gives the student the knowledge of basic properties and applications of commodity and engineering plastics and thermoset materials and their significancein polymer industries. With this information student can select a suitable polymer to manufacture the required products.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able,

- To differentiate the polymeric materials based on their properties
- To select a suitable polymeric material for a particular application
- To correlate the influence of structure on the properties of the polymer
- To choose the compound ingingredients as per the requirements
- To classify the various additives based on their properties

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**SPECIALIY AND HIGH PERFORMANCE PLASTICS** Speciality plastics: Polyphenylene oxide (PPO), Polyphenylenesulphide (PPS), polysulfones (PSU), Poly ether ether ketone (PEEK), Polyamide-imides (PAI), Polyether imides (PEI) - Raw materials, structure, properties, processing behavior and applications -Liquid crystalline polymers	**15Hrs**
II	**THERMOSETTING RESINS - I** Phenolic plastics - Novolaks - Resols – hardening - resin manufacture - Phenol formaldehyde moulding powder – compounding ingredients – preparation of moulding powders - properties of Phenolic mouldings and applications. Amino plastics: Urea formaldehyde resins – theories of resinification - moulding powders - properties - applications Melamine formaldehyde resins - resinification – moulding powders - properties and applications. Unsaturated Polyesters laminating resins, raw materials – production of resins – curing systems (examples only) - properties and applications	**15Hrs**
III	**THERMOSETTING RESINS - II** Epoxy resins - preparation of resins from Bis-phenol A - structure and properties of cured resins – Applications. Polyurethanes: Flexible foams, rigid foams and semi rigid foams (properties and applications only) Silicones: Silicone resins – preparation – properties – applications	**15Hrs**

IV	**COMPOUNDING** Compounding - Principles of compounding - Compounding ingredients and their functions: Fillers-Plasticisers - Colorants (Dyes and Pigments) - Lubricants - Stabilizers - Processing aids - Flame retardants - Blowing agents - Anti - oxidants - UV stabilizers - Anti static agents and Impact modifiers	**15Hrs**
V	**PLASTICS BLENDS & ALLOYS** Introduction to polymer blends and alloys – difference between blends and alloys – classification of polymer blends – compatible and incompatible blends – compatibilisation of polymers – important properties and applications of industrial polyblends like PPO/PS (NORYL), ABS/PC, PPO/PBT & POM/Elastomer (DELRIN)	**15Hrs**

Text Books:

1.J.A. Brydson - Plastic Materials –7th Ed-Butterworths-Heinemann–London (1999)

2.D.C. Miles, J.H. Briston - Polymer Technology – Chemical Publishing Co.-New York (1972)

3.RobertV.Milby - Plastics Technology - McGraw Hill Book Co. - 1973.

Reference Books:

1.A.S.Athalye-Plastics Materials Handbook Vol I & II-Multi-tech Publishers (2002)

2.Gachter / Muller - Plastics Additives (4th ed) – Hanser Publishers (1996).

3.W.C.Wake - Fillers for Plastics – Iliffe, London (1971)

4.H.V.Boenig - Polyolefins: Structure and Properties – Elsevier (1986)

5.W.S.Penn - P V C Technology –Applied science, London (1991)

6.Murugan N - Understanding Plastics materials – GES Publications (2007).

7.Geoffrey Pritchard - Plastics Additives – Chapmann& Hall (1998).

8.S.Schwartz&H.Goodman - Plastics Material and Processes - Van Nostrand Reinhold Co. - 1982.

9.J.Harry Dubois & Frederic W.John - Plastics - Van Nostrand Reinhold Co. - 1981.

10.W.S.Penn - P V C Technology – Applied Science, London – 1971.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973520

Semester : V Semester

Subject Title : **PLASTICS PROCESSING-II**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS PROCESSING-II	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	COMPRESSION, TRANSFER MOULDING & EXTRUSION	12
II	INJECTION MOULDING	12
III	BLOW MOULDING & THERMOFORMING	11
IV	ROTATIONAL MOULDING, CALENDERING & FOAMS	11
V	FINISHING, DECORATION & JOINING OF PLASTICS	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

Raw polymeric materials are converted into products by any one of the processing methods. It is, therefore, extremely necessary to have good understanding about the principles of processing and also different problems encountered during processing and to rectify the same to get good products in the processes. This subject enables the students to apply the understanding of various processing techniques used in almost all polymer industries

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to:

- Select a suitable processing method to manufacture a plastics product as per the requirement
- Differentiate one process from the other
- Identify the various components of the plastics processing machinery
- Define the function of various components of the plastics processing machinery
- Define the principle behind each plastics processing method
- Choose a suitable method to join the various plastics parts

Unit	Nameofthe Topic	Hours
I	**COMPOUNDING AND ANCILLARY EQUIPMENTS** Compounding equipments - Two roll mill - Ribbon blender - Internal mixer - Banbury mixer - Twin screw extruder - Sigma mixer. Ancillary equipments - Drier - Definition of moisture content, Types of Dryers, Tray Dryer, Rotatory dryer and Oven dryers— Hopper dryer –Dehumidifying dryer - Hopper loader – Vacuum hopper loader - Additive feeder - Granulator - 3 blade, 4blade granulator - Mould temperature controller – Chilling plant – Colour blender - Magnetic grills	**12 Hrs**
II	**EXTRUSION** **Extrusion:** Basic principle of extrusion process-Barrel-screw nomenclature - Design - Types - L/D ratio-compression ratio- Screen pack-Breaker plate. Types of extruders - Single screw extruder -Twin screw extruder – Types and applications. **Application of extrusion process:** Production unit of Pipe - Sizing unit- Winding and cutting unit – production unit of Tubular blown film extrusion- Wire and cable covering - Co-extrusion (basic concepts only) - Trouble shooting	**12 Hrs**

III	**ROTATIONAL MOULDING AND FOAMS** Rotational moulding - Basic process and materials - Types of rotational moulding - Batch type machine process - Carousel type machine process - Straight line machine process - Applications of rotational moulding - Advantage and trouble shooting. Introduction to plastic foaming process - Structural foam moulding – Low pressure and high pressure moulding - Foaming process - Expandable polystyrene foam - PVC foam - Polyethylene foam - UF foam - Rigid PU foam - Flexible PU foam - Applications.	**11 Hrs**
IV	**PLASTICS RECYCLING** Sorting and separation techniques of mixed plastics-Wet and Dry Separation, Centrifugal sorting, Electrostatic sorting, X-ray based sorting and sorting by selective dissolution. Size Reduction- Granulators; Densification process: Agglomerators; Pulverization process. Recyclingof PET- contamination problems, Mechanical and chemical recycling process Recycling of HDPE bottles, LLDPE film, PP Battery cases, PVC bottle and film, EPS foam and their applications	**11 Hrs**
V	**UNIT V: FINISHING, DECORATION & JOINING OF PLASTICS** Finishing of plastics - Filing, grinding, buffing, drilling, turning, slitting. Decoration of plastics - Preparation for decorating - Printing - Silk screen printing - Pad printing - Rotogravure printing and flexographic printing - Hot stamping Adhesives - Types of adhesives - Advantage of adhesive bonding - Solvent and dope cement - Elastomeric cement - Thermosetting adhesives - Characteristic of adhesives. Welding of plastics - Ultrasonic welding - Vibration welding - Heat sealing - Thermal heat sealing - Dielectric sealing	**11 Hrs**

TextBooks:

1. D.H.Marton,Jones-PolymerProcessing- ChapmanandHall(1989)

ReferenceBooks:

1. E.C.Bernhardt-Processing ofThermoplastics Materials -Reinhold,NewYork.
2. Holmes-Walker,W.A-Polymer Conversion, AppliedSciencePublishers-(1975)
3. JohnD.Beadle-PlasticsForming-Macmillan,London(1981)
4. JamesE.S.,Margolis- DecorativeofPlastics -Hanser Publishers(1986)
5. GleannLBeall-RotationalMoulding-HanserPublishers(1998)

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973530A

Semester : V Semester

Subject Title : **ELECTIVE THEORY- I: FRP TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
FRP TECHNOLOGY	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	RESINANDREINFORCEMENTMATERIALS	12
II	DESIGNANDFABRICATIONOFMOULDS	12
III	PROCESSINGMETHODS	11
IV	POSTPROCESSINGMETHODS	11
V	APPLICATIONSOFCOMPOSITES	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

This course helps the students to understand the various processing methods involved in thepreparationoffiberreinforcedplastics.Theywillchooseaparticularresin,reinforcing materials and other additives used to manufacture a FRP product. Also, the basic design concept and fabrication of mould.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to:

- Select the suitable raw material for the given application
- Choose the suitable processing method to manufacture the required FRP product
- Fabricate the polymer composite as per the requirement
- Identify the necessary post processing method for finishing of the FRP product

FRP TECHNOLOGY

Contents:Theory

Unit	Name of the Topic	Hours
I	**RESIN AND MATRIX SYSTEM** Basic concept of fiber reinforced plastics - History and development of fiber reinforced plastics – Properties of composites and comparison of fiber reinforced plastics and metals – Resins used, unsaturated polyester resin, vinyl ester resins, epoxy resins, PP and ABS – Reinforcing materials used	**12Hrs**
II	**REINFORCEMENT MATERIALS** Fibre Reinforcements – Glass fibre and its types, carbon, aramid, natural fibres, Boron, CeramicFibers- Miscellaneous additives used, catalyst, accelerator, fillers, pigments and mould release agents – Their functions in moulding.	**12Hrs**
III	**FABRICATION AND PROCESSING** Basic concept of fabrication of moulds for fiber reinforced plastics – Selection of mould materials – Type of moulds used – Preparation of prepregs – SMC – DMC compounds – Their properties - Processing method of fiber reinforced plastics – Hand lay up – Spray up – Vacuum bag – Pressure bag – Compression moulding – Injection moulding – Auto clave moulding – Centrifugal casting – Filament winding – Pultrusion –Matched die moulding and resin transfer moulding.	**11Hrs**
IV	**POST PROCESSING METHODS** Post processing methods – Cutting – Trimming – Machining – Joining – Filling - grinding – buffing – drilling – turning - slitting - Preparation for decorating - Mechanical fastening – Adhesive bonding and painting- Moulding defects and their remedies.	**11Hrs**

V	**APPLICATIONS & TESTING OF COMPOSITES** Applications of FRP – Household applications -– Building and Construction applications - Land transportation applications – Automobile applications - Rail transport applications- Marine applications – Aero space applications – Medical applications. Testing of Composites – Non Destructive Testing (X ray image, Ultrasonic test - introduction only), Fiber volume fraction	**11Hrs**

TEXTBOOKS:

L.Holloway-Compositematerials-Elsevier,Amsterdam,1966

REFERENCES:

1. BrianParkyn-Glass Reinforced Plastics-Ilifee,1970.
2. Gibbs&Cox-Marine Design Manual for FRP-McGrawHill Book Co. -1960.
3. P.Ghosh- Fiber science and technology-Tata McGrawHill, New Delhi,2004
4. GeofferyPritchard-ReinforcedPlasticsDurability-WoodheadPublilshing -2000.
5. R.H.Sonneborn-FiberglassReinforcedPlastics-Reinhold,NewYork,1954

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973530B

Semester : V Semester

Subject Title : **ELECTIVE THEORY- I:**
B.ADVANCED PLASTICS MOULD MANUFACTURING

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
ADVANCED PLASTICS MOULD MANUFACTURING	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	UNCONVENTIONAL MACHINING	12
II	CNC MACHINES	12
III	COMPUTER AIDED DESIGN AND GEOMETRIC MODELLING	11
IV	COMPUTER AIDED MANUFACTURING AND CIM	11
V	GT-FMS-AGV-ROBOTICS-CMM	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

Manufacturing, the major and the most important aspect in industries needs utmost care and attention. Knowledge about various processes and allied areas will be of great use to the personnel involved in production. This will provide the students an opportunity to skill themselves for the industrial scenario. The topics included aim to inculcate in the students the skills of Lathe, Drilling, Reciprocating Machines, milling, grinding and other machining processes which are very much essential for a technician to at promptly and measuring instruments with precision.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to know about

- Introduction and development of mould manufacturing techniques.
- Construction and working of CNC machines.
- Computer modeling and CIM

ADVANCED PLASTICS MOULD MANUFACTURING TECHNOLOGY

Contents:Theory

Unit	Name of the Topic	Hours
I	**UNIT I: UNCONVENTIONAL MACHINING** Ultrasonic machining – Process - Application - Advantages and Limitations. Chemical machining – – Process - Application - Advantages and Limitations.Electrochemicalmachining – – Process - Application - Advantages and Limitations.Electro Chemical Grinding – Process - Application - Advantages and Limitations.ElectricDischarge Machining - – Process - Application - Advantages and Limitations. Plasma arc machining – – Process - Application - Advantages and Limitations. Laser beam machining – – Process - Application - Advantages and Limitations.	**12 Hrs**
II	**UNIT II: CNC MACHINES** Numerical control - definition - components of NC systems - Development of NC - DNC – CNC and Adaptive control systems - Working principle of a CNC system - Advantage of CNC machines - Difference between NC and CNC. - Types of turning centre: horizontal, vertical - Types of machining centers: horizontal spindle, vertical spindle, universal machines - machine axis conventions, CNC machines – drilling – grinding – EDM - wire cut EDM construction, Maintenance of CNC machines.	**12 Hrs**
III	**UNIT III: COMPUTER AIDED DESIGN AND GEOMETRIC MODELLING** Introduction - CAD definition - Shigley's design process - CAD activities - Benefits of CAD. CAD hardware: Input / Output devices - CRT - Raster scan & Direct view Storage tube - LCD. Plasma panel. mouse, digitizer, image scanner, drum plotter, flat bed plotter, laser printer- Secondary storage devices : hard disks, floppy disks, CD, DVD, flash memory. Types of CAD system: PC based CAD system - Workstation based CAD system - graphics workstation – workstation hardware, workstation software – configuration and specification - CAD software packages – Auto CAM Geometric modeling techniques: wire frame - surface. Solid modeling - graphics standards: Need, GKS. - IGES - DXF. Introduction to finite element methods - (brief description only).	**11 Hrs**

IV	**UNIT IV: COMPUTER AIDED MANUFACTURING AND CIM** CAM definition - Functions of CAM - benefits of CAM - integrated CAD/CAM organization - process planning -master data - structure of a typical CAPP - types of CAPP : variant type, generative type - advantages of CAPP - aggregate production planning - Master Production Schedule (MPS) - capacity planning - Materials Requirement Planning (MRP) - introduction to enterprises resources planning - Manufacturing Resources Planning (MRP-II) -just in time manufacturing philosophy – Concept of CIM – Evolution of CIM – CIM hardware, software	**11 Hrs**
V	**UNIT V: GT-FMS-AGV-ROBOTICS-CMM** Group technology – part family – classification and coding – coding structure – Optiz, MICLASS, code system – benefits of GT. FMS introduction – components of an FMS system – workstations —planning of FMS– application and benefits of FMS. AGV – components – functions – benefits. Robot – definition – anatomy and classification - basic elements of a Robot – types – applications Coordinate measuring machines construction, working principles and specifications	**11 Hrs**

References :

1. "Modern Machining process", P.C. Pandey and H.S.Shan, Tata McGraw-Hill Publishing company Limited, New Delhi, 2007.
2. "Advanced Machining Process" , V.K. Jain, Allied Publishers PVT Limited 2007.
3. Mikell. P. Groover, 'CAD / CAM : Prentice Hall of India Pvt. New Delhi 1993
4. P. Radhakrishnan, S. Subramanyan, ' CAD / Cam / CIM', New Age International Limited, Publishers.
5. P. Radhakrishnan, ' Computer numerical control machines', New central Book agency, 1996.
6. G.E Thyer, Computer numerical control of machine tools, BH Newnes, 1991.
7. T.K. Kundra, P.N.Rao, N.K. Tiwari, Numerical control and computer aided Manufacturing, Tata McGraw – Hill, New Delhi, 1991.
8. S. Krar, CNC Technology and Programming, McGraw- Hill 1990.
9. MikellP.Groover, Automation, Production Systems and Computer Integrated manufacturing, Prentice – Hall international Edition.
10. Barry Hawkes, The CADCAM Process, Pitman Publishing.
11. David Gibbs, AN INTRODUCTION TO CNC MACHINING, Cassel.

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973530C

Semester : V Semester

Subject Title : **ELECTIVE THEORY- I: PLASTICS RECYCLING**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
PLASICTS RECYCLING	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	PLASTIC WASTE GENERATION & SEPARATION TECHNIQUES	12
II	PROCESSING OF COMMINGLED PLASTIC WASTE	12
III	RECYCLING OF POLYOLIFINS, PET & PVC	11
IV	RECYCLING OF ENGINEERING HERMOPLASTICS	11
V	RECYCLING OF THERMOSET COMPOSITES	11
	Test & Model Exam	7
TOTAL		**64**

RATIONALE:

The subject aims at providing students the knowledge of various types of polymer recycling techniques. The subject will help the students to understand the importance of polymer recycling.

Objectives:

On completion of the units of syllabus contents the students will be able to:

- Identify the sources of plastics waste generation
- Segregate the polymer waste for recycling
- Recall the recycling codes of commodity and engineering plastics.
- Select suitable recycling Techniques

1. # PLASTICS RECYCLING

Content:Theory

Unit	Nameofthe Topic	Hours
I	**PLASTICWASTEGENERATION&SEPARATIONTECHNIQUES** Plasticsproductionandconsumption- Plasticwastesgenerationsourceandtypes-sortingandseparationtechniques- 4R&I-Recyclingmethods – Primary, Secondary and tertiary recycling of plastics - Plasticroad.	**12 Hrs**
II	**PROCESSINGOFCOMMINGLEDPLASTICWASTE** Sizereductionofrecycledplastics- cutting/shredding,densification,pulverization and chemical size reduction processes- municipal solid wasteandcomposition- recyclingofplasticsfromurbansolidwastes-household waste – industrial sector –density and mechanical properties ofrecyclable plastics- Processing of commingled / mixed plastic waste –superwood,plasticlumber	**12 Hrs**
III	**RECYCLINGOFPOLYOLIFINS,PET&PVC** Recycling of polyolefins – polyethylene films – Polypropylene batteryrecyling- Recycling of HDPE fuel tanks - PET recycling methods – PETfilmrecycling-Applicationsof polyolefinandPET recyclate –PVC Recycling	**11 Hrs**
IV	**RECYCLINGOFENGINEERINGTHERMOPLASTICS** Recycling of Engineering thermoplastics- PC, PBT, Nylon, PPO, ABS andpolyacetalsandtheirblends	**11 Hrs**

V	**RECYCLINGOFTHERMOSETCOMPOSITES** Recycling of Polymer thermoset composites – regrind processes - SMCscrap – BMC scrap - pyrolysis and energy recovery –– Actonplasticwastemanagement	**11 Hrs**

TEXTBOOKS:

1. Polymerrecycling,¯Science,TechnologyandApplications,JohnScheirs,JohnWiley&Sons ,England1988
2. ¯RecyclingofPlasticMaterials(Ed)‖,FrancescoPaoloLaMantia,ChemTecPublishing.
3. ¯PlasticsWasteManagement(Ed)‖,NabilMustafa,MarcelDekker,NewYork,1995.

REFERENCES:

1. Degradeablepolymers, RecyclingandPlasticWasteManagement(Eds)AnnChristineAlbertson andSamuelJ.Huang, Marcel Dekker, NewYork.
2. PolymerRecycling,JohnSchiles
3. Recycling &PlasticsWasteManagement,Edited byDr.J.S.Anand,CIPET,1997.

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973540

Semester : V Semester

Subject Title : **ENTREPRENEURSHIP AND STARTUP**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
ENTREPRENEURSHIP AND STARTUP	**4 Hrs**	**64 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	ENTREPRENEURSHIP-INTRODUCTION AND PROCESS	10
II	BUSINESS IDEA AND BANKING	10
III	STARTUPS,E-CELL AND SUCCESS STORIES	10
IV	PRICING AND COST ANALYSIS	10
V	BUSINESS PLAN PREPARATION	10
	Revision, Field visit and Preparation of case study report	14
TOTAL		**64**

RATIONALE:

Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes ineducationalcurriculumparticularlytoestablishrelevancetoemergingsocio-economicenvironments; to ensure equity of opportunity and participation and finally promoting concern for excellence.In this context the course on entrepreneurship and startup saimsatin stilling and stimulating humanurge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and there by ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:

At the end of thestudyof5thsemesterthestudentswillbeableto

- To excite the students about entrepreneurship
- Acquiring Entrepreneurial spiritandre sourcefulness
- Understanding the concept and process of entrepreneurship
- Acquiring entrepreneurial quality, competency and motivation
- Learning the process and skills of creation and management of entrepreneurial venture
- Familiarization with various uses of human resource for earning dignified means of living
- Know its contribution in and role in the growth and development of individual and the nation.
- Understand the formation of E-cell
- Survey and analyze the market to understand customer needs
- Understand the importance of generation of ideas and product selection
- Learn the preparation of project feasibility report
- Understand the importance of sales and turn over
- Familiarization of various financial and non financial schemes
- Aware the concept to fin cubation and startsups.

DETAILED SYLLABUS

Unit	NameoftheTopics	Hours
1	**Entrepreneurship–IntroductionandProcess** ● Concept,FunctionsandImportance ● MythsaboutEntrepreneurship ● ProsandConsofEntrepreneurship ● ProcessofEntrepreneurship ● BenefitsofEntrepreneur ● Competenciesandcharacteristics ● EthicalEntrepreneurship ● EntrepreneurialValuesandAttitudes ● Motivation ● Creativity ● Innovation ● Entrepreneurs-asproblemsolvers ● Mindset of an employee and anentrepreneur ● BusinessFailure-causesandremedies ● RoleofNetworkinginentrepreneurship	**10**
2	**BusinessIdeaandBanking** ● TypesofBusiness:Manufacturing,TradingandServices. ● Stakeholders:sellers,vendorsandconsumers ● E-commerceBusinessModels ● Types of Resources - Human, Capital and Entrepreneurialtools	**10**

	● GoalsofBusiness;GoalSetting ● Patent,copyrightandIntellectualpropertyrights ● Negotiations-Importanceandmethods ● CustomerRelationsandVendorManagement ● Sizeandcapitalbasedclassification ofbusinessenterprises ● Roleoffinancialinstitutions ● RoleofGovernmentpolicy ● Entrepreneurialsupportsystems ● Incentiveschemesforstategovernment ● IncentiveschemesforCentralgovernment	
3	**Startups,E-cellandSuccessStories** ● ConceptofIncubationcentre's ● Activities of DIC , financial institutions and otherrelevance institutions ● SuccessstoriesofIndianandglobalbusinesslegends ● FieldVisittoMSME's ● Varioussourcesofinformation ● Learntoearn ● Startupanditsstages ● RoleofTechnology-E-commerceandSocialMedia ● Roleof E-Cell ● E-CelltoEntrepreneurship	**10**
4	**PricingandCostAnalysis** ● CalculationofUnitofSale,UnitPriceandUnitCost ● TypesofCosts-VariableandFixed,OperationalCosts ● BreakEvenAnalysis	**10**

	● Understandthemeaningandconceptofthe term CashInflowandCashOutflow ● PrepareaCashFlowProjection ● PricingandFactorsaffectingpricing ● Understand the importance and preparation of IncomeStatement ● LaunchStrategiesafterpricingandproofof concept ● Branding-Businessname,logo,tagline ● Promotionstrategy	
5	**BusinessPlanPreparation** ● Generationof Ideas. ● BusinessIdeasvs.BusinessOpportunities ● Opportunity Assessment – Factors, Micro and Macro MarketEnvironment ● SelectingtheRightOpportunity ● Productselection ● Newproductdevelopmentandanalysis ● Feasibility Study Report – Technical analysis, financialanalysisand commercial analysis ● MarketResearch-Concept,ImportanceandProcess ● MarketingandSalesstrategy ● Digitalmarketing ● SocialEntrepreneurship ● RiskTaking-Concept ● Typesofbusinessrisks ● ExecutionofBusinessPlan	**10**

REFERNCE BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, SahityaBhawan Publications,Agra -282002
2. Dr.G.K.Varshney,BusinessRegulatoryFramework,SahityaBhawanPublications,Agra

-282002

3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill(India)PrivateLimited,Noida-201301
4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small businessmanagement,PearsonEducationIndia,Noida-201301
5. CharantimathPoornima M. Entrepreneurship Development and Small BusinessEnterprises,PearsonEducation,Noida-201301
6. Trott,InnovationManagement andNewProductDevelopment,PearsonEducation,Noida -201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing HousePvt. Ltd.,NewDelhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited,NewDelhi
9. I.V.Trivedi,RenuJatana,IndianBankingSystem,RBSAPublishers,Rajasthan
10. SimonDaniel,HOWTOSTARTABUSINESSININDIA,BUUKS,Chennai-600018
11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writingthe BusinessPlan, NotionPressMedia Pvt.Ltd., Chennai600095.

Autonomous Examination – Evaluation Pattern Internal Mark Allocation

Assignment(Theoryportion)*	-	10
SeminarPresentation	-	10
Attendance	-	5
Total	**-**	**25**

Note: * Two assignments should be submitted. The same must be evaluated andconvertedto 10marks.

Guidelinesforassignment:

First assignment - Unit I

Second assignment - Unit II

Guidelines for Seminar Presentation - Unit III

Each assignment should have five three marks questions and two five marks questions

AUTONOMOUS EXAMINATION

NOTE:

1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Autonomous Practical Examinations.
3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (45Marks) and practical portions (55Marks) should be completed for board examinations.
4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do theexaminationfor3Hrs.
5. For Written Examination: theory question and answer:(45Marks)
6. Ten questions will be asked for 3marks each. Five questions from each unit 1 & 2.(10X3=30).
7. ForPracticalExamination:ThebusinessplanorFeasibilityreportorReportonUnit4& 5 should be submitted during the board practical examinations. The same haveto beevaluatedforthereport submission(40marks).
8. Viva-vocecarries(15Marks)

DETAILED ALLOCATION OF MARKS

Sl. No	Description	Marks
Part A	Written Examination-Theory Question and answer (10questionsx3 marks:30marks&(3questionsx5 marks:15marks)	45
Part B	Practical Examination – Submission on Business Plan/ Feasibility Report or Report on Unit 4&5	40
Part C	Viva voce	15
	Total	100

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973550

Semester : V Semester

Subject Title : **THERMOSETS PREPARATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
THERMOSETS PREPARATION PRACTICAL	**5 Hrs**	**96 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing polymer preparation related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

- Preparevariousthermoset materials
- Do the insitu polymerization
- Prepare blends of thermoset materials

List of experiments:

1. Preparation of novolac (PF) resin
2. Preparation of resol (PF) resin
3. Preparation of Urea formaldehyde resin
4. Preparation of Melamine formaldehyde resin
5. Preparation of Resorcinol formaldehyde resin
6. Preparation of Polyurethane
7. Preparation of unsaturated polyester resin
8. In situ polymerization of thermoset materials (any one)
9. Preparation of epoxy resin
10. Preparation of blends (any one)

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment / Instrument	No.
1.	Polymer preparation and identification bench with burner facility	1
2.	Electronic weighing balance	1

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973560

Semester : V Semester

Subject Title : **PLASTICS PROCESSING - II PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS PROCESSING - II PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

- Calculate the cycle time of various processes
- Optimise the cycle time ofa process to manufacture a plastics product using a particular machine
- Handle the processing machineries
- Operate the ancillary equipments

List of experiments:

1. Recycling of polymer using Scrap Grinding
2. Operation on Hopper loader
3. Operation on Tray Drier
4. Operation on Hopper Drier
5. Processing of plastics using Compression Moulding
6. Processing of plastics using Extrusion
7. Processing of plastics using Vaccum Forming
8. Processing of plastics using Pressure Forming
9. Processing of plastics using Rotational Moulding
10. Processing of plastics using Calendaring

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	Scrap Grinding	1
2.	Hopper loader	1
3.	Tray Drier	1
4.	Hopper Drier	1
5.	Compression Moulding Machine	1
6.	Extruder	1
7.	Vaccum Forming Machine	1
8.	Pressure Forming Machine	1
9	Rotational Moulding Machine	1
10.	Calendaring Machine	1

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973570A

Semester : V Semester

Subject Title : **ELECTIVE PRACTICAL- I: FRP TECHNOLOGY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
FRP TECHNOLOGY PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

- Calculate the gel time and peak exothermic temperature
- Prepare various fibre based polymer composite laminate
- Prepare various particulate filled polymer composite laminate
- Measure various mechanical properties of polymer composite
- Make a prepregs of polymer composite

List of experiments:

1. Preparation of moulding compound (any one)
2. Preparation of composites using moulding compounds
3. Preparation of Glass fiber reinforced thermoset laminate
4. Preparation of Natural fiber reinforced thermoset laminate
5. Preparation of thermoset laminate using particulate filler
6. Preparation of Thermoplastic Composites
7. Joining of composites
8. Preparation of adhesives for composites
9. Manufacture ofasimple FRP product by Handlay-uptechnique (UPE resin)
10. Manufacture ofasimple FRP product by Handlay-uptechnique (Epoxy resin)
11. Manufacture ofasimple FRP product by Spraylay-uptechnique

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Sigma Mixer	1
2.	Compression moulding machine	1
3.	Hand Injection moulding machine	1
4.	Spray gun	2
5.	Laminatecutter	2
6.	Productmould for hand lay up	2
7.	Hotairoven	1
8.	Electronicweighingbalance	1

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973570B

Semester : V Semester

Subject Title : **ELECTIVE PRACTICAL- I: B.PLASTICS MOULD MANUFACTUIRUNG PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS MOULD MANUFACTUIRUNG PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

know about mould and its components

- Selection of suitable machines for machining each.
- Make hand injection mould
- Make hand compression mould
- Machine all the mould elements.
- Check for dimensions using measuring instruments
- Assembling the elements.

LIST OF EXPERIMENTS

CYCLE: 1. MAKING OF HAND INJECTION MOULD

1. Machining of insert core plate
2. Machining of insert cavity plate
3. Machining of core/cavity retainer plate.

CYCLE:2. MAKING OF HAND COMPRESSION MOULD

4. Machining of integer core plate
5. Machining of integer cavity plate
6. Machining of Guide Pillar.
7. Machining of Guide Bush.

CYCLE: 3.MOULD ELEMENTS ASSEMBLY

8. Machining of Sprue Bush.
9. Machining of Register Ring.
10. Engraving of Letters and Numbers on mould plates (Forward & Reverse).
11. Assembly of HAND INJECTION MOULD AND COMPRESSION MOULD using the above mould components.
12. Study on CNC Machines(Lathe and Milling)

LIST OF EQUIPMENTS (Per batch 30 students)

1. Lathe : 2 Nos
2. Shaper : 2 Nos
3. Drilling machine : 1 No
4. Horizontal Milling machine : 1 No
5. Vertical Milling machine : 1 No
6. Surface Grinding machine : 1 No
7. Cylindrical Grinding machine : 1 No
8. Slotter : 1 No
9. Pantograph Engraving machine : 1 No
10. Measuring instruments : Sufficient

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973570C

Semester : V Semester

Subject Title : **ELECTIVE PRACTICAL- I: RECYCLING PRACTICAL** **C.PLASTICS**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS RECYCLING PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

- Reduce the size of polymer waste by grinding
- Separate plastics waste by density method
- Compare the various mechanical properties of recyclate compound with the virgin compound
- Prepare a product from polymer waste

Listofexperiments:

1. Size reduction of Plastic waste by grinding
2. Separation of Plastic waste by density method
3. Compaction of plastic flakes and density comparison
4. Recycling of PET by wet & dry separation
5. Blending of plastic recyclate in blender
6. Preparation of polymer recyclate blend
7. Manufacture plastic product from recycled plastics
8. Comparison of tensile properties of recycled plastics with virgin plastics
9. Comparison of hardness properties of recycled plastics with virgin plastics
10. Comparison of MFIof recycled plastic with virgin plastic

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	Screw type Injection mouldingmachine withmould	1
2.	Tworollmill	1
3.	Scrapgrinder	1
4.	MFI Tester	1
5.	Tensilespecimenmould	1
6.	Productmould	2
7.	Compressionbuttonmould	
8.	Electronicweighingbalance	1
9.	Tworollmillknife	2
10.	Brassrod	2
11.	Dumbbellcutter	1
12.	Durometer(shoreA &D)	1

VI
SEMESTER

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973610

Semester : VI Semester

Subject Title : **PLANT ENGINEERING AND MANAGEMENT**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLANT ENGINEERING AND MANAGEMENT	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	PRINCIPLESOFMANAGEMENT	15
II	ORGANISATIONANDQUALITYCONTROL	15
III	MARKETINGFUCNTIONS-INDUSTRIALRELATIONS ANDSAFETY	15
IV	ENVIRONMENTALMANAGEMENT	14
V	DISASTERMANAGEMENT	14
	Test & Model Exam	7
TOTAL		80

RATIONALE:

In this subject the basic concepts on the various principles of management about scientific management, entrepreneurship, different types of organanisation is covered to enable the students to understand working of various management principles. Students also get an opportunity to learn about PPC, Leadership and the modern quality control techniques.In this subject due emphasis is given for marketing functions, Industrial relation and safety and also Environmental management and disaster management techniques which are highly essential for the present situation.

OBJECTIVES:

On completion of the units of the syllabus, the student will be able:

- To understand the different types of ownership in industry
- To select the plant location and product
- To understand the important factors of production planning control
- To carry out suitable effective methods for inventory control
- To maintain good quality control
- To understand the different marketing techniques
- To appraise the safety performance
- To analyse the impact of pollution
- To select the suitable solid waste treatment techniques
- To understand various treatments and disposal methods for waste water
- To choose the suitable air pollution control methods
- To understand the disaster management
- To identify different causes for disaster management
- To understand the insurance claim and rehabilitation methods

PLANT ENGINEERING AND MANAGEMENT

Unit	Nameofthe Topic	Hours
I	**UNITI:PRINCIPLESOFMANAGEMENT** Role of industry –Types of ownership-Proprietorship, partnership-Privatelimited-Publiclimited-Industrialco-operatives-Scientificmanagement –Functions of management –Types of organization –line-staff-functional organization –concept and Definition –Importance of Entrepreneurship – Promotion of self employment –Government policies -Advantages and limitations of entrepreneurship–Sites election–Principles of plant layout –Factors influencing plant location. Plant maintenance – importance – Breakdown maintenance, preventive maintenance and scheduled maintenance.	**15 Hrs**

II	**UNITII:ORGANISATIONANDQUALITYCONTROL** Leadership in organization-Decision making-Communication-Motivation - Group dynamics -Production planning and control -Need for planning - Routing -Scheduling -Despatching -PERT -CPM -Inventorycontrol-ABCanalysisofsafetystock-EOQmethod-Purchasingprocedures -Records - Bincards - Quality control -Basic concepts -Definition-Terminology-Presentationofdata-Indianstandardsonqualitycontroltechnique-Qualitycertificationschemes-ISO9000etc.	**15 Hrs**
III	**UNIT III MARKETING FUNCTIONS, INDUSTRIAL RELATIONS ANDSAFETY** Marketing -Definition -Information -Functions -Pricing policy - Pricingtechniques-Sales-Definition-Personalselling-Promotionmix-	**15 Hrs**
	Advertising-Sales packaging-Promotion techniques Trade unions -Disputes -Settlement -Collective bargaining -Welfare concepts -Rights and responsibilities of employer and employee - Factories act 1948 -Industrial dispute act 1947 -Trade unions act 1926 -ESI act1948-Childlabouract Process safety -Hazard analysis -Risk analysis -Common causes of accidents -Safety training -Electrical hazard -Fire hazard -Explosion hazard -First aid.	
IV	**UNITIV:ENVIRONMENTALMANAGEMENT** Introduction - Environmental Ethics - Assessment of Socio Economic Impact-Environmental Audit-Mitigation of adverse impacton Environment - Importance of Pollution Control - Types of Industries and Industrial Pollution. Solid waste management-Characteristics of Industrial wastes-Methods of Collection, transfer and disposal of solid wastes - Converting waste to energy-Hazardous waste management Treatment technologies. Waste water management - Characteristics of Industrial effluents - Treatment and disposal methods - Pollution of water sources and effects on human health. Air pollution management-Sourcesandeffects-Dispersionofairpollutants-Airpollution control methods-Air quality management. Noise pollution management - Effects of noise on people - Noise control methods.	**14 Hrs**
V	**UNITV:DISASTERMANAGEMENT** Introduction - Disasters due to natural calamities such as Earth quake,Rain, Flood, Hurricane, Cyclonesetc - Man made Disasters - Crisis duetofires, accidents, strikesetc- Loss of property and life. DisasterMitigationmeasures-Causesformajordisasters-RiskIdentification-HazardZones-Selection of sites for Industries and residential buildings-Minimum distances from Sea-Orientation of Buildings - Stability of Structures - Fire escapes in buildings - Cyclone shelters-Warning systems.Disaster Management-Preparedness,Response,Recovery-Arrangements to be made in the	**14 Hrs**

	industries / factories and buildings -Mobilization of Emergency Services - Search and Rescue operations -First Aids - Transportation of affected people - Hospital facilities - Firefighting arrangements - Communication systems - Restoration of Power supply-Getting assistance of neighbours / Otherorganizations in Recovery and Rebuilding works-Financial commitments-Compensations to be paid-Insurances - Rehabilitation**.**	

Textbook:

1. O.P.Khanna Industrialengineering andmanagement,Dhanpatrai&sons.
2. C.S.Rao-EnvironmentalEngineering and Pollutioncontrol,Wiely

ReferenceBooks:

1. IndustrialManagementbyDalilal&MansurAli
2. HandBookof Industrial SafetyandHealth,TradeandTechnicalPress Ltd.,Modern, U.K.1980.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973620

Semester : VI Semester

Subject Title : **TESTING OF PLASTICS**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
TESTING OF PLASTICS	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	IDENTIFICATION OF PLASTICS, PHYSICAL PROPERTIES & SPECIMEN PREPARATION	15
II	TEST SPECIMEN PREPARATION AND TESTING OF MECHANICAL PROPERTIES OF PLASTICS	15
III	THERMAL AND OPTICAL PROPERTIES OF PLASTICS	15
IV	ELECTRICAL AND WEATHERING PROPERTIES OF PLASTICS	14
V	TESTING OF PLASTICS END PRODUCTS	14
	Test & Model Exam	7
TOTAL		80

RATIONALE:

This subject covers different properties of polymers namely mechanical properties, thermal properties, optical properties, electrical properties, weathering properties and chemical properties also the methods by which these properties can be determined. In this subject different test can be performed to product slike pipes, films, hoses and belts.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to:

- Choose the condition for performing the tests
- Apply the procedure as per the standard for a particular property
- Analyse the factors affecting the test result
- Find the mechanical, optical , thermal, rheological, chemical, flammability and weathering properties of a Plastic material
- Identify the testing to be carried out for a polymer product as per the standard

TESTING OF PLASTICS

Content:Theory

Unit	Name of the Topic	Hours
I	**IDENTIFICATION OF PLASTICS, PHYSICAL PROPERTIES & SPECIMEN PREPARATION** Identification of plastics - Simple physical preliminary tests like visual examination, heating and softening behavior, floatation test, cutting with knife, scratching with nail, bending, tearing and dropping sound test. Burning tests - Nature of flame, odour, speed of burning, smoke and other characteristics - Detection of elements by Copper wire test (Beilstein test) and Sodium fusion extract test – Confirmation of plastics by chemical analysis. **Physical Properties:**Specific gravity - Density and bulk Density- Water absorption - Moisture analysis - Melting point - Solubility test - Significance and method of determination. **Specimen Preparation :** Importance of testing - Specifications - Test specimen preparation of plastics - Equipments used for preparation – Injection moulding – compression moulding – contour cutting - Standards (ASTM, ISO, ISI - Brief idea only) - Conditioning procedure.	**15Hrs**
II	**MECHANICAL PROPERITES OF PLASTICS** **Short-term mechanical properties**: 1. Tensile strength - Stress curve - Equipment and procedure –Factors affecting Tensile strength. 2. Impact strength (Izod, Charpy and falling weight impact tests only) 3. Shear strength - compressive strength - flexural strength - Test methods and procedure. **Long-term mechanical properties**:	**15Hrs**

	1.Creep - Equipment and procedure - Factors affecting creep. 2.Fatigue - Types of fatigue tests - Factors affecting fatigue **Mechanical properties of surfaces**: 1. Measurement of Hardness (Rockwell&Durometer only) - Factors affecting Hardness. 2. Abrasion - Taber abrasion - equipment and procedure.	
III	**THERMAL AND OPTICAL PROPERTIES OF PLASTICS** **Thermal properties**: Thermal conductivity - Measurement of Thermal conductivity - Co efficient of thermal expansion - Determination of temperature of deflection under load -Heat distortion Temperature (HDT) - Vicat Softening Point (VSP) - Melt Flow Index (MFI) - Significance and method of determination - Cup flow test. **Flammability tests**: Flammability test for flexible plastics - Flammability test for self-supporting plastics - Oxygen Index Test - Critical Oxygen Index -Method of determination of critical Oxygen Index (COI) value only **Optical properties**: Luminous Transmittance - Haze – Gloss - Definitions and method of determination.	**15Hrs**
IV	**ELECTRICAL & WEATHERING PROPERITES OF PLASTICS** **Electrical properties**:Introduction - Requirements of an insulator - Di-electric strength - Measurement of Di-electric strength - Factors affecting Di-electric strength. Di-electric constant and dissipation factor - Measurement of Di-electric constant-Arc resistance - Measurement of Arc resistance – Tracking **Weathering properties**: Accelerated weathering test - Outdoor weathering test - Significance and measurement. **Chemical properties**: Immersion test - Stain resistance test - Solvent stress cracking resistance - Environmental Stress Cracking Resistance (ESCR) - Significance and method of determination.	**15Hrs**
V	**TESTING OF PLASTICS END PRODUCTS** Testing of plastic products - Significance of product testing. Pipe testing – Classification of pipes - PVC and HDPE Pipes - Test methods. Plastic packages -Rigid - Semi rigid and Flexible packages - General test methods. Laminates / Multilayer films - Parameters for acceptance. Testing of Blow moulded containers. Testing of cellular materials - Rigid foam test methods and flexible foam test methods.	**15Hrs**

TextBooks:

1. VishuShah, "Handbook ofPlasticTestingTechnology", WileyInter-science Publications,1998.
2. J.HaslamandH.A.Willis, "IdentificationandAnalysisofPolymer",ILIFFE,London, 1972.

ReferenceBooks:

1. G.Gordon Cameron - Ellis Hand Book of Analysis of Synthetic Polymers-HonwoodLtd.,-1977
2. A.S.Athalye–Identificationand testing ofplastics - Multitechpublishers -1992.
3. Howtoidentify plastics-CIPETPublication-2003.
4. PaulKluckow-Rubberand PlasticsTesting–Chapman&Hall,London–1963.
5. Murugan.N- BasicsofTesting ofPlastics – StudyMaterial.
6. L.E.Nielsen-MechanicalpropertiesofPlastics-Reinhold,NewYork–1962.
7. J.H.Collins-TestingandAnalysisofPlastics–PlasticsInstitute–1955.
8. R.P.Brown-Handbookofplastictestingmethods-1971
9. K.J.Saunders-Identification ofPlatics&Rubbers–Chapman&Hall–1966.
10. M.E.Baird - Electrical Properties of polymeric materials – Plastics and RubberInstitute,London–1973.

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973630A

Semester : VI Semester

Subject Title : **ELECTIVE THEORY II:A.PLASTICS MOULD AND DIE DESIGN**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS MOULD AND DIE DESIGN	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	MOULD MATERIALS & MOULD DESIGN FOR PART REQUIREMENT	15
II	MOULD DESIGN FUNDAMENTALS, FEED, EJECTION &COOLING SYSTEM	15
III	INJECTION MOULD DESIGN	15
IV	COMPRESSION AND TRANSFER MOULD DESIGN	14
V	BLOWMOULD & EXTRUSION DIE DESIGN	14
	Test & Model Exam	7
TOTAL		80

RATIONALE:

With the rapid expansion of Industries such as Paper, Sugar, Pharmaceutical, dyeing and food industries the demand for all these, technologists also increases. This specialized subject makes students aware about manufacturing process, quality control and packaging techniques.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to:

- ❖ Recall the basic terminology involved in mould construction.
- ❖ Identify the various components of the mould and its functions
- ❖ Select the suitable material for various mould components
- ❖ Design the mould/die for a polymer product
- ❖ Apply the mould design concept in the feed and cooling system

PLASTICS MOULD AND DIE DESIGN

Unit	Nameofthe Topic	Hours
I	**UNIT-I:MOULD MATERIALS &MOULD DESIGN FOR PART REQUIREMENT** Introduction of mould materials - Elementary idea about Pre hardenedmouldmaterialsandstandardmouldbase. Introductiontoproductdesign-Designtomeetprocessingrequirements-Positioningofgates,runners,venting,weldlines-Design ofribs and bosses - Rim- Gussets - Radii - Fillets- Partingline.Warpage-Wall thickness – Draft.Undercuts -Internal,external .Inserts-Functionsofinserts-Effectofinsertsonmouldstrength	**15 Hrs**
II	**UNIT-II:MOULD DESIGN FUNDAMENTALS, FEED ,EJECTION & COOLING SYSTEM** Basic terminology and mould construction - Cavity and core (integer,insert) - Bolster - Sprue bush - Register ring - Guide pillar - Guidebush - Parting line construction- Stepped parting line-Irregularparting surface - Local stepped and profile parting line. Feed system -sprue- runners- runner cross section-Balancingofrunner. Typesofgatingsystem-Winkle gate-Diaphragm gate -Spruegate - Edgegate-Fangate-Ringgate-Submarinegate-Pinpointgate - Tab gate - Selection ofgate and application - Types of ejection - Pin,steppedpin, D pin,blade,sleeve,stripper,air,doubleejection-Spruepullers -Spruebush. Cavity cooling techniques - Core cooling techniques - Bolster coolingtechniques-Sprue cooling-Ejectioncooling.	**15 Hrs**

III	**UNITIII:INJECTION MOULD DESIGN** Types of injection moulds - General arrangement of 2 plate, 3 platemould-Single,multiimpressionmoulds-Singledaylight,multidaylight moulds - Split mould - Actuation techniques - Cam actuation,finger cam, dog leg - Actuation of side core and side cavity - Empiricalformulafordeterminationofnumberofcavities-Elementarycostestimatingprocedureformould.Hotrunnermould-Elementaryknowledge about hot runnermould.	**15 Hrs**
IV	**UNITIV:COMPRESSION AND TRANSFER MOULD DESIGN** Compression mould types - flash, semi-positive, positive moulds - Advantages, limitations. Empirical formula for calculation of: Bulk factor, weight of moulding, no. of cavity required, shrinkage - Mould heating -Types of heaters. Transfer moulds-Pot type moulds, Plunger type moulds. Simple calculation for: Size of transfer pot, transfer plunger, sprue dimension,transfer chamber,clamp pressure,transfer pressure	**14 Hrs**
V	**BLOWMOULD&EXTRUSIONDIEDESIGN** Die and mandrel design - Die head - Side feed - Spider or axial flow head - Accumulator head - - Parison programming - Parting line - Pinchoff design - Neck pinch off - Base pinch off - Flash pockets – Venting and mould surface finish -Cooling. Extrusion Die geometry - Designing of pipe die - Production line - Torpedo, mandrel, land - length, approach section - Inline type - offsettype-Designofblownfilm-Sidefeeddie,bottomfeeddie-Designofsheet die - Production line - Coat hanger type - Design of profile die(one type only)-Elementary idea about mono filament die.	**14 Hrs**

TEXTBOOKS:

1. RonaldD.Beck -ProductDesign-Van Nostrand-Reinhold Co.(1970)
2. R.G.W.Pye- Injection moulddesign-4thEd-Longmanscientific&Technical(2000)
3. R.H.Bebb - PlasticMouldDesign-(Compression&Transfermould)
4. Rosato-BlowMouldDesign-HanserPublications(1972)
5. M.V.Joshi-ExtrusionDieDesign-MacmillanIndialtd(1992)

REFERENCES:

1. J.HarryDubois&WayingI.Prible-Plasticmouldengineeringhandbook(1982)
2. Laszlosors-PlasticMouldEngineering-Pergamonpress(1967)
3. RobertAMalloy-Plasticpartdesign for injectionMoulding-Hanser(1994)
4. Chereminishroff-.ProductDesignand Testing ofPolymeric Material-Hanser(1992)
5. Levy-PlasticsProductDesignHand Book-VannostrandreinholdCo.(1977)
6. DominickVRosatoand DonaldVRosato-InjectionMouldingHandbook(1985)
7. Ralph.E.Wright-MouldedThermosets-HanserPublishers(1991)
8. Klausstoeckhert-Mouldmaking Handbook for Plastic Engineers -Hanser(1983)
9. Pauk.A.Tres-Designing Plasticpartsfor assembly-Hanser(1994)
10. WalterMichaeli – ExtrusionDies-2ndEd- Hanser(1992)

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973630B

Semester : VI Semester

Subject Title : **ELECTIVE THEORY II:B.PACKAGING TECHNOLOGY**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
PACKAGING TECHNOLOGY	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	PACKAGING SCOPE AND MATERIALS	15
II	CONVERSION PROCESSES OF PACKAGES	15
III	FLEXIBLE PACKAGING	15
IV	RIGID AND SEMIRIGID PACKAGING	14
V	TESTING OF PLASTICS PACKAGING	14
	Test & Model Exam	7
TOTAL		80

RATIONALE:

With the rapid expansion of Industries such as Paper, Sugar, Pharmaceutical, dyeing and food industries the demand for all these, technologists also increases. This specialized subject makes students aware about manufacturing process, quality control and packaging techniques.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to:

- List out the functions of packaging
- Compare the advantages of plastics packaging over conventional packaging materials
- Select suitable material as per packaging requirement
- Analyse the packaging regulations and legislation.
- Choose a suitable processing method
- Measure the important properties like, barrier properties, migration properties, and compatibility properties.

PACKAGING TECHNOLOGY

Contents:Theory

Unit	Nameofthe Topic	Hours
I	**PACKAGINGSCOPEANDMATERIALS** Introduction to Plastics packaging – scope and functions of packaging – advantages of plastics packaging over conventional packaging materials – Major forms of plastics materials used in packaging: LDPE, LLDPE, HDPE, PP, PS, PVC, Nylon, Polyesters, EVOH, PVDC and Poly Vinyl Alcohol - distribution hazards – special requirements of food and medical packaging– packaging regulations and legislation. Selection criteria of suitable polymeric packages for oils, fats and alliedproducts,soapsanddetergents,cosmetics,food,dairyproducts,beverages,medicines,chemicals,paints,householdandindustrialgoods.	**15 Hrs**
II	**CONVERSIONPROCESSESOFPACKAGES** **Conversion processes:** Closures production by Injection moulding process – different types of closures: friction closures, snap fit closuresandthreadedclosures–Plasticsbottlesproductionbyblowmoulding– extrusion blow moulding – injection blow moulding – stretch blow moulding – moulds for plastics bottles – multi resin bottles –Plastics tubes manufacture by extrusion – rotational moulding – metalizing –decoration process– in mould labeling-barrier coatings.	**15 Hrs**

III	**FLEXIBLEPACKAGING** **FlexiblePackaging:**Extrusion film–cast film –cast sheet–blown film – multi layer film and sheet: coating, laminations and co-extrusion – stretchandshrinkwrap–pouches:pillowpouches,threesidesealpouches, four side seal pouches, stand up pouches, forming pouches –bulk and heavy duty bags – heat sealing: bar or thermal sealing, impulsesealing,bandsealing,hotwireorhotknifesealing,ultrasonicsealingand friction sealing, radiant sealing, dielectric, magnetic and induction sealing–advantages offlexible packaging.	**15 Hrs**
IV	**RIGIDANDSEMIRIGIDPACKAGING** **Rigid and semi rigid Packaging:**Thermoformed packages–thermoforming moulds –form/fill/seal thermoforming operations – wrapforming–blisterpackaging–skinpackaging-mouldedpackages–Expanded polystyrene and other foam systems – Design of mouldedcushioningsystems–applicationsofexpandedpolystyreneinpackaging-Advantagesanddisadvantagesofmouldedfoams–Comparisonbetweenflexible packaging and rigid packaging.	**14 Hrs**
V	**TESTINGOFPLASTICSPACKAGING** Testing of plastic packages – barrier properties – oxygen permeability – carbondioxidepermeability–oxygenheadspace–watervapourtransmissionrate(WVTR)-migrationproperties–compatibilityproperty–printing–labeling–pigmenting–sterilization systems.	**14 Hrs**

TextBooks:

1. E.M.Susan-Understanding Plasticpackaging technology–HanserPublishers(1995)

ReferenceBooks:

1. A.S.Athalye-Plastics in packaging –Tata McGraw-HillCo.Ltd.,NewDelhi(1992)
2. R.L.Butzko- Plasticssheetforming–HanserPublishers(1995)
3. JohnD.Beadle-Plasticsforming–Ilifee,London(1982)
4. E.C.Bernhardt-Processingof ThermoplasticMaterials –.HanserPublishers(1995)

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973630 C

Semester : VI Semester

Subject Title : **ELECTIVE THEORY II: C.PLASTICS PRODUCT QUALITY CONTROL MANAGEMENT**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
PLASTICS PRODUCT QUALITY CONTROL MANAGEMENT	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

Topics and Allocation of Hours

Unit	Topics	Hours
I	INTRODUCTION	15
II	TQM PRINCIPLES	15
III	TQM TOOLS AND TECHNIQUES I	15
IV	TQM TOOLS AND TECHNIQUES II	14
V	QUALITY SYSTEMS	14
	Test & Model Exam	7
TOTAL		80

RATIONALE:

This subject will help the students to understand the techniques to be adopted to ensure the quality of the product and thereby the customer satisfaction. It also, enriches the students with the rejection analysis and prevention techniques. It aided the vital quality system and certification required to ensure the quality of the product.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to:

- ❖ Remember the basic principles behind quality
- ❖ Apply the techniques for defect analysis
- ❖ Analyse the cause and effect using TQM techniques
- ❖ Choose the quality system requirement as per the organization requirements

PLASTIC PRODUCT QUALITY CONTROL MANAGEMENT

Content:Theory

Unit	Nameofthe Topic	Hours
I	**INTRODUCTION** Introduction – Need for quality – Evolution of quality – Definitions ofquality – Dimensions of product and service quality – Basic concepts ofTQM – TQM Framework – Contributions of Deming, Juran and Crosby –Barriers to TQM – Quality statements – Customer focus – Customerorientation,Customersatisfaction,Customercomplaints,Custom erretention –Costsofquality.	**15 Hrs**
II	**TQMPRINCIPLES** Leadership – Strategic quality planning, Quality Councils – Employeeinvolvement – Motivation, Teamwork, Quality circles Recognition andReward, Performance appraisal – Continuous process improvement –PDCA cycle,5S,8DKaizen– SupplierRating.	**15 Hrs**
III	**TQMTOOLS ANDTECHNIQUESI** The seven traditional tools of quality – New management quality tools – Sixsigma:Concepts,Methodology,applicationstomanufacturing,servicese ctor-Benchmarking–Reasontobenchmark,Benchmarkingprocess–FMEA – Stages,Types.	**15 Hrs**
IV	**TQMTOOLS ANDTECHNIQUESII** Quality circle – Quality function deployment (QFD) - Total productivemaintenance (TMP) – Concept – Performance measure - Businessprocess re-engineering (BPR) – principle, reengineering process,benefitsandlimitations.	**14 Hrs**
V	**QUALITYSYSTEMS** NeedforISO9000-QualitySystem-Elements,Implementationof Quality System, Documentation, Quality Auditing, ISO 14001 - PurposeofIATF16949– SignificanceofREACHCompliance	**14 Hrs**

TEXTBOOK:

1. DaleH.Besterfiled, etat., "TotalqualityManagement", PearsonEducationAsia, Third Edition, IndianReprint2006.

REFERENCES:

- JamesR.EvansandWilliamM.Lindsay, "TheManagementandControlofQuality", 8th Edition, FirstIndianEdition, CengageLearning, 2012.
- Suganthi.LandAnandSamuel, "TotalQualityManagement", PrenticeHall(India)Pvt. Ltd.,2006.
- Janakiraman.BandGopal.R.K., "TotalQualityManagement-TextandCases", Prentice Hall (India)Pvt.Ltd.,2006.

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973640

Semester : VI Semester

Subject Title : **PLASTICS TESTING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS TESTING PRACTICAL	**6 Hrs**	**96 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

- Identify the suitable testing machine, specimen, condition and standard
- Find outthemechanicalpropertiesofthepolymericmaterialasperthestandard
- Measuretheflammabilitypropertiesofthepolymericmaterialasperthestandard
- Determine the thermal properties of the polymeric material as per the standard
- Calculatetherheologicalpropertiesofthepolymericmaterialasperthestandard

List of experiments:

1. Determination of water absorption
2. Preparation of test samples using sample cutters and contour cutting machine
3. Determination of Tensile properties.
4. Determination of compressive properties
5. Determination of IZOD Impact strength
6. Determination of Falling weight Impact strength
7. Determination of Hardness using Rockwell Hardness testing machine.
8. Determination of Hardness using Durometer Hardness testing machine
9. Determination of Taber Abrasion Resistance.
10. Determination of Melt Flow Index (MFI).
11. Determination of Heat Distortion Temperature (HDT).
12. Determination of Vicat Softening Temperature (VSP).
13. Determination of flammability behavoiur
14. Determination of ESCR

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	UTMwithaccessoriesandfixtures	1
2.	Durometer(ShoreA&D)	1
3.	Rockwell Hardness Tester	1
4.	Impacttester(Izod&Charpy)	1
5.	Fallingdartimpacttester	1
6.	Taber Abrader	1
7.	MFI Tester	1
8.	HDT & VSPTester	1
9	ESCR Tester	1
10.	Weighing Balance	1
11.	Dialgauge	2
12.	Verniercaliper	2
13.	Hotairoven	1
14.	Stopwatch	2
15.	Screwgauge	2
16	Sample Cutter	1

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973650A

Semester : VI Semester

Subject Title : **ELECTIVE PRACTICAL II: A.PLASTICS MOULD AND DIE DESIGN PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PLASTICS MOULD AND DIE DESIGN PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

- Design and draw mould basic components and their assembly
- Design and draw two plates inglecavity and multicavity mould
- Design and drawt hree plate multicavity mould
- Design and draw compression mould
- Squaring of a metal plate on Milling and Grinding.
- Machining of mould components
- Making a cavity plate by Vertical milling
- Making Core plate by Milling and Grinding.

List of experiments:

1. Drawing mould basic component - Ejection grid assembly (top view and cutsectional view)
2. Design and draw single cavity two plate injection mould
3. Design and draw multi cavity two plate injection mould
4. Design and draw multi cavity three plate injection mould
5. Design and draw compression mould (any one type)
6. Squaring of a metal plate on Milling and Grinding.
7. Machining Guide pillar &Guide bush
8. Drilling and counter boring holes for Guide pillar and Guide bush
9. Making a cavity plate by Vertical milling
10. Making Core plate by Milling and Grinding.

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	AutoCad Software(not less than 2007)	1
2.	System(aboveP3configuration)	30
3.	Lathe	1
4.	Milling Machine	1
5.	Surface Grinding Machine	1
6.	Drilling Machine	1

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973650B

Semester : VI Semester

Subject Title : **ELECTIVE PRACTICAL II: B.PACKAGING TECHNOLOGY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	End Semester Examination	Total	
PACKAGING TECHNOLOGY PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. These can be achieved by experience in handling various equipments. This is accomplished by doing engineering related experiments in practical classes.

Objectives:

On completion of the experiments given in the syllabus the students will be able to:

- Identify the suitable testing machine, specimen, condition and standard
- Find out the mechanical properties of the packaging material as per the standard
- Measure the thermal properties of packaging material as per the standard
- Determine the optical properties of the packaging material as per the standard
- Calculate therheological properties of the packaging material as per the standard

List of experiments:

1. Determination of Thickness and GSM
2. Determination of Tensile strength
3. Determination of Tear strength
4. Determination of Falling dartimpact strength
5. Determination of static and dynamic friction
6. Determination of transmittance
7. Determination of ESCR
8. Determination of Dimension stability
9. Determination of Meltflo windex
10. Determination of Heat stability

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	NameofEquipment/Instrument	Quantity
1.	UTM with accessories and fixtures	1
2.	Elmendorfteartester	1
3.	Falling dartimpacttester	1
4.	Friction tester	1
5.	Opticaltesterfortransmittance	1
6.	MFI Tester	1
7.	ESCR apparatus with specimen holder	1
8.	Hotairoven	1
9	Dialgauge	1
10.	Electronic weighing balance	1
11.	Screw gauge	2

Reference:

1.Packaging Technology Labmanual

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973650B

Semester : VI Semester

Subject Title : **ELECTIVE PRACTICAL II: C.POLYMER PRODUCT QUALITY CONTROL PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PACKAGING TECHNOLOGY PRACTICAL	**5 Hrs**	**80 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

RATIONALE:

This practical session will help the students to have hands on experience in ensure the quality of the product and thereby the customer satisfaction. Also, the students will know to analyse the polymer product rejection through rejection analysis and prevention techniques.

OBJECTIVES:

On completion of the units of syllabus contents the students will be able to:

- Prepare DFMEA, PFMEA and Control plan for a new polymer rproduct
- Carryout Pareto analysis technique for controlling the rejection
- Apply why-why technique for analyzing the cause and effect factor
- Prepare Gantt chart for a newly proposed project

List of experiments:

1. Preparation of DFMEA for development of new thermoplastic product
2. Preparation of PFMEA for development of new thermoplastic product
3. Preparation of DFMEA for development of new thermoset product
4. Preparation of PFMEA for development of new thermoset product
5. Pareto analysis for the rejection of any one thermoplastic product
6. Pareto analysis for the rejection of any one thermoset product
7. Why-Why analysis for the rejection of any one thermoplastic product
8. Why-Why analysis for the rejection of any one thermoset product
9. Preparation of Gantt chart for a new polymer product development
10. Preparation of control plan for a new polymer product development

LIST OF EQUIPMENTS / INSTRUMENTS, MATERIAL, MANUALS REQUIRED (FOR ABATCHOF 30STUDENTS):

S.No.	Name of Equipment/Instrument	Quantity
1.	Drawing table	30

TEXTBOOK:

1. DaleH.Besterfiled, etat., "TotalqualityManagement", PearsonEducationAsia,Third Edition,IndianReprint2006.

REFERENCES:

1. JamesR.EvansandWilliamM.Lindsay, "TheManagementandControlofQuality", 8th Edition, FirstIndianEdition, CengageLearning, 2012.
2. Suganthi.LandAnandSamuel, "TotalQualityManagement", PrenticeHall(India)Pvt. Ltd.,2006.
3. Janakiraman.BandGopal.R.K., "TotalQualityManagement-TextandCases", Prentice Hall (India)Pvt.Ltd.,2006.

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N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973660

Semester : VI Semester

Subject Title : **PROJECT WORK AND INTERNSHIP**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
PROJECT WORK AND INTERNSHIP	**6 Hrs**	**96 Hrs**	**25**	**100***	**100**	**3 Hrs**

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks

OBJECTIVES:

- To develop the creative talents in the students.
- The project work should involve less cost, easy manufacturing technique andsuitable to thereal life situations.
- The project work should be useful to the mankind.
- To give the students a taste of real life problem solving and thus simulate industrial environment within the polytechnic.
- To develop those abilities that cannot be developed by normal class roomsituationssuchasgroupwork,sharingresponsibility,initiate,creativity etc.

a) Internal assessment mark for Project Work & Internship:

ProjectReviewI	…	**10 marks**
ProjectReviewII	…	**10 marks**
Attendance	…	**05marks**(Awardofmarks sameas theorysubjectpattern)
Total	…	**25 marks**

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the

inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work and Internship in Autonomous Examinations:

Demonstration/Presentation	25marks
Report	25marks
VivaVoce	30marks
InternshipReport	20marks
Total	**100*marks**

*Examination will be conducted for 100 marks and will be converted to 75marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone byevery candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry/ Government or Private certified agencies which are in social sector /Govt.Skill Centres /Institutions /Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work and Internship Autonomous examination.

Note: -

- The selection of Project work should be carried out in V semester itself.
- The Project committee's approval should be obtained prior to the executing ofproject.
- The students should maintain a logbook of the work carried out by them.

VII
SEMESTER

TAMILNADU GOVERNMENT POLYTECHNIC COLLEGE, (Autonomous), MADURAI- 11

N - 20 SCHEME

DIPLOMA IN PLASTIC TECHNOLOGY (FULL TIME-SANDWICH)

(Implemented from the Academic Year 2021 – 2022 onwards)

Course Name : 2073: DIPLOMA IN PLASTIC TECHNOLOGY

Subject Code : 4973710

Semester : VII Semester

Subject Title : **INDUSTRIAL TRAINING AND VIVA VOCE**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	End Semester Examination	Total	
INDUSTRIAL TRAINING AND VIVA VOCE	**-**	**-**	**50**	**150***	**200**	**3 Hrs**

1. Introduction

The main objective of the sandwich Diploma Course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 semesters of 31/2 years duration, the subjects of 3 years- Full Time Diploma Course being regrouped for academic convenience.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

- Industrial training-VII Semester
- Duration: June to October

2. ATTENDANCECERTIFICATION

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the sectional mark.

3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the formot diary to be submitted to the concerned staff incharge of the institution.This will be reviewed while awarding sectional marks.
- Comprehensive report attheend of each spell which will be used for Board

3.1 IndustrialTrainingDiary

Students are required to maintain the record of day –to- day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars(Presence, Absence,Leave,Holidays etc.).The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In additions to the diary, students are required to submit a comprehensive report on training with details of the organization where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant / product /process / construction along with intensive in-depth study on any one of the topics such as processes, methods, tolling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of industrial training. Any data, drawings etc. should be incorporated with the consent of the Organization.